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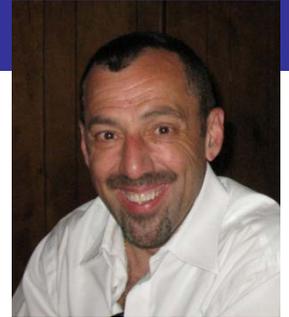
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**SOCIETY OF PLASTICS ENGINEERS**

# Medical Plastics Division

2013 – Fourth Quarter



## *Letter from the Chair:*

Dear Friends and MPD Members,

Welcome back! I hope everyone had a great summer, I know I did. It has been a few months since my first letter as Chair and there are certainly no shortage of topics to speak about when it comes to Medical Plastics and the activities of our Division.

Our first MiniTec of the year was a great success as we teamed with the Milwaukee and Chicago SPE sections for a great event, filled with top notch content and rich networking. The conference and dinner took place in Gurney, IL, north of Chicago. Look for a review elsewhere in this newsletter.

We are going to end 2013 with the first ever SPE TOPCON in Shanghai China, being directly sponsored by the Medical Plastics Division, the Injection Molding Division, and SPE. This will be a two day conference at the city center Marriott in Shanghai. The program is being finalized but be on the lookout for more details. This will be a first class event with some of the best international speakers in Injection Molding and Medical Polymers.

The business of Medical Plastics and our entire industry is being reshaped before our eyes by many forces (internal and external). There are certainly challenges in our healthcare system, and great opportunity exists for innovation and game-changing technologies. Advancements in Medical Plastics and processes are leading the way to reduce costs and increasing efficacy in many areas. New applications in nano- and micro-technologies along with drug delivery and targeted/implanted therapeutics make these times extremely exciting.

The shift in Healthcare to a consumer driven model along with the advancement in IT (apps, other) and telehealth applications are changing how healthcare is delivered, monitored, tracked and stored.

We'd love to hear your thoughts!

Lastly, we are always looking for new talent that is interested in participating in our Division at the Board level and always welcome any comments, suggestions or participation from our members. Please drop me a line at [mark@bonifacioconsulting.com](mailto:mark@bonifacioconsulting.com) if you are interested in learning more about our division and how you can participate. We are currently getting ready to start our nomination process for the next Board class as well.

Don't forget to be on the lookout for TOPCON Shanghai information!!!

Sincerely,

*Mark Bonifacio*  
2013 – 2014 Chair

**Upcoming Conferences  
- TOPCON Shanghai –  
- ANTEC DUBAI -**

**Technical Presentation**

**Read about the MD&M East  
Conference from different views.**

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## **From The Editor:**

The Medical Plastics Division (MPD) has been extra busy lately. The efforts of many years' work is starting to show results these last several months.

Most people probably think of ANTEC as a North American convention, although it does have international attendees. We have been expanding from this thinking on a continental scale, going both smaller and bigger at the same time. Recent work by MPD members has gone down the scale to put together conferences which focused on regional topics of interest and up the scale to the international level to reach out to our members worldwide. MDP worked with the Chicago and Milwaukee regional sections of SPE to present a one day MINITEC, which is described on page 8 in this issue. On an international scale, MPD is heavily involved with the upcoming TOPCON in Shanghai China and ANTEC DUBAI UAE (p 10).

All these conferences, from regional to international, help our members communicate on a worldwide scale but also sustain the Medical Plastics Division so that we can keep on doing what we need to and want to and get better at all the time.

Come join us.

*Norris M. Tollefson*

*September 2013*

# ANTEC -- Call For Papers

April 28-30  
Las Vegas, Nevada

*The Medical Plastics Division*



SOCIETY OF PLASTICS ENGINEERS

**ANTEC** 2014

ANTEC 2014 will be held on April 28-30 at the Rio All Suite Hotel and Casino in Las Vegas, Nevada

The Medical Plastics Division of SPE is inviting YOU to present

Topics of interest include, but are not limited to:

**Medical Product Design**

Sustainability  
Performance simulation

**Drug Delivery & Biotechnology**

Novel formulations and applications

**Manufacturing Trends**

Automation, novel processes

**Sterilization**

New procedures  
Bio-burden/bio-compatibility

**Biomaterials**

Meeting the needs of medical devices

**Quality Control**

Assessing incoming polymers

**FDA Impact on Materials & Devices**

Regulatory considerations  
Quality Systems  
Human Factors considerations  
Validation (process/material)

**Polymer Analysis**

Effective use to reduce defects/downtime rejections

**Micro Extrusion and Molding**

Equipment and Materials

Awards will be presented for the best student paper and best commercial paper. The awardee for the best student paper will receive \$1000.00 towards their travel costs to the conference.

**The Process**

Abstract submission, paper submission, and the review process are managed entirely online.

Becoming an ANTEC author is easy. If you have not submitted a paper or made a presentation at ANTEC in the past, please consider the possibility...it will be worth your efforts!

For further information please contact Ed Fewkes, Technical Program Chair for the Medical Plastics Division:

Phone: (607) 765-8743; email: [FewkesEJ@Corning.com](mailto:FewkesEJ@Corning.com)

Paper Submissions are due on October 25, 2013

# Recent Conferences



Exposition: **June 18-20, 2013**  
Conference: **June 17-20, 2013**  
Pennsylvania Convention Center  
Philadelphia, PA



MDMeast.com



**EUROTEC**  
2 0 1 3

**JULY 4-5**  
Cité Centre de Congrès  
Lyon, France

## MINITEC 2013



Society of Plastics Engineers

*Technology Advances in Plastic Materials and Processing  
for Medical Devices*

Presented by the SPE Medical Plastics Division  
with the Chicago and Milwaukee Regional Sections of SPE.

**Monday,  
September 9, 2013**

**Holiday Inn Gurnee  
6161 West Grand Ave  
Gurnee, IL 60031**



Exposition: **June 18–20, 2013**  
 Conference: **June 17–20, 2013**  
 Pennsylvania Convention Center  
 Philadelphia, PA



MDMeast.com

### MEDTECH POLYMERS

<b>Chair's Opening Remarks</b>	<i>Vipul Davé, Research Director</i> Johnson & Johnson
<b>The Future of Biomaterials: Challenges for Future Medical Devices and Combination Products</b>	<i>Michael Drues, President</i> Vascular Sciences
<b>Suture and Fiber Materials Selections for Cardiovascular Device Component</b>	<i>Ed Boarini, Senior Vice President/General manager</i> Teleflex Medical
<b>Meeting the Demands of Medical Device Performance Requirements with Polymer Bioresorbable Vascular Scaffolds</b>	<i>Ashley Kelley, Manager</i> Abbott Vascular
<b>Innovative Catheter Development</b>	<i>John Felton, Market Development Manager</i> Daikin America
<b>Antimicrobial Parylene Coating for Medical Devices</b>	<i>Rakesh Kumar, VP Technology</i> Specialty Coating Systems
<b>Ultra High Molecular Weight Polyethylene: Materials Properties and Applications</b>	<i>Anthony Verrocchi, Technical Marketing Engineer</i> Ticona
<b>Laser Micromachining of Polymer Based Medical Devices</b>	<i>Walker Ramanathan, Business Development Manager</i> Resonetics
<b>MEMS Intraocular Drug Delivery Device</b>	<i>Ronalee Mann, Senior Associate</i> Exponent

At the MD&M conference, the focus of the leadoff session was on breakthrough technology. Two presentations on wireless technology and mHealth (mobile health) introduced products that showed how technology is being used in products now and in the near future. Wireless communicating patient monitoring systems no longer need to be tethered to the wearable sensors. Critical conditions can now be measured continuously rather than intermittently when healthcare workers are available. Better monitoring usually means better outcomes; but this comes with new complications such as how do healthcare workers manage and interpret all the data pouring in from these 24/7 monitoring systems?

An intriguing presentation by Shiv Gaglani, a medical student from Baltimore, discussed the explosive rise of companies and products that take advantage of smart phones as foundation for new medical devices. Two products were demonstrated; a portable, heart monitor linked wirelessly to an iPhone which displayed the patient's heartbeat, and an ophthalmoscope that couples with a smart phone camera for imaging the blood vessels on the back of a patient's eye. Both devices converted the smart phone into a sophisticated medical diagnostic tool.

The future of healthcare using mobile devices is called mHealth. mHealth has resulted in over 90 start-up companies raising over \$2 million in funding in the last 12 months. This enabling technology helps by reducing cost, increasing availability and stimulating novel product innovations. For more information on mHealth and examples of products available, check out: <http://www.medgadget.com>.

No session on medical device materials would be complete these days without mentioning the concerns about hospital-acquired infections (HAIs) and the actions taken to mitigate this widespread problem. New additive technology and improvements to the polymers used have improved the surfaces resistance to frequent cleaning and repeated sterilization. Next generation materials for use as flexible solution container materials were presented as were alternative materials for clear molded components.

*Len Czuba*



**Presenters Ed Boarini (top left), Ashley Kelley (top right), Anthony Verrocchi (bottom left) and Rakesh Kumar (bottom right) at the MD&M East 2013 Conference in Philadelphia PA.**

As a speaker and an attendee of other conferences and exhibits, I really enjoyed this year's MD&M East show in Philadelphia. The quality of the presentations and diversity among the attendees made this a great event. Many show exhibitors and attendees were very optimistic about the activity and the quality of the contacts they were getting. I saw some excellent new packaging technologies, along with other new developments in the laser and micro/nano world of medtech. Many contract manufacturers are adding to their footprints and capabilities. OEMs continue to look to full service, one stop suppliers and look for suppliers near their own facilities. Overall, I think it was a good show and the future prospects for 2013 and 2014 were optimistic with opportunities waiting to be captured. Our industry does face significant headwinds, with the device tax, FDA reform, and reimbursement uncertainties, but I firmly believe that those companies that embrace challenge and the changing face of the global healthcare environment will be the big winners while providing the safe, effective and cost effective solutions that are needed to face our healthcare requirements for the future and beyond.

*Mark Bonifacio*

Society of Plastics Engineers Medical Plastics Division (MPD) sponsored a one day **MedTech Polymers** session on June 20 in collaboration with UBM Canon during the MD&M Conference in Philadelphia, PA. The session was organized and chaired by Vipul Davé (Johnson & Johnson). There were eight presentations in the session which were delivered by experts in the medical plastics field. The topics of the talks included future biomaterials challenges and implantable devices such as sutures and stents; materials and processes used in catheter technology; innovations in antimicrobial coatings for medical devices and materials for orthopedic applications; and micromachining of polymers and MEMS based drug delivery devices.

Slides of the presentations for the MD&M West Conference are available to the attendees on the UBM Cannon Conference website. All the talks were well attended and at the end of each presentation there was an interactive discussion which exhibited a lot of interest in the educational value that was provided by each speaker. The session was attended by about 30 conference attendees!

A similar one day **MedTech Polymer** session will be held at the MD&M West Conference in Anaheim in February, 2014. We look forward to seeing all of you at this conference to enjoy and learn about innovations in Medical Plastics!

*Vipul Dave*



Society of Plastics Engineers

**EUROTEC® 2013**

**Cite Congress Exhibition Center  
July 4-5, 2013  
Lyon, France**

## **A Focus on Medical Plastics and Polymers**

### **Microstructural Changes in Polylactides During an Initial 7 Day Degradation Period in PBS**

Jose-Ramon Sarasua, *University of the Basque Country (UPV/EHU)*

### **New Application for Plastic in Medical Devices**

Radoni Mario, *Politechnic University of Marche*

### **Development of Contact Lenses for Ocular Drug Delivery**

David Phelan, *Waterford Institute Of Technology*

### **Evaluation of Shape Memory of a PLGA Glassy Copolymer**

Jose-Ramon Sarasua, *University of the Basque Country (UPV/EHU)*

### **Innovative Material Solutions for High Heat Autoclaving of Medical Devices**

Mark van der Mee, *SABIC*

### **Controlling Biodegradable Polymer Thermal and Degradation Properties Through Molecular Design**

Dan Lewitus, *Shenkar College of Engineering and Design*

### **Influence of Ag Nanoparticles on Polymer Composite Optical Properties**

Jovita Pudlauskaitė, *Kaunas University of Technology*

### **Effects of Thermo-Mechanical Treatments on Mechanical Properties of Lactide Derived (Co)Polymers**

Susana Petisco, *UPV-EHU*

### **Radiopaque Filler Considerations When Designing a Medical Device**

Brian LaBrec, *Foster Corporation*

### **Effects of Thermo-Mechanical Treatments on Mechanical Properties of Lactide Derived (Co)Polymers**

Susana Petisco, *UPV-EHU*

### **Soft Contact Lens Development Using UV Curing**

Austin Coffey, *Waterford Institute of Technology*

### **The Effects of Electron Beam and Gamma Irradiation on the Properties of Poly (Ether-Block-Amide) Compounded with Various Stabilisers**

Kieran Murray, *Athlone Institute of Technology*

The Eurotec 2013 meeting held in Lyon, France on 4-5 July 2013 was hugely successful. The European Medical Polymers Division of the Society of Plastics Engineers had two full days of talks ranging from Contact Lens Development to lactide polymers and their uses in state-of-the-art applications in the medical industry. Prof. Jose Ramon Sarasua and Susana Petisco from the University of the Basque Country outlined how polylactide bioabsorbable polymers can be engineered to have multiple applications using their shape memory characteristics. Dr Seán Lyons, Centre Manager for the Applied Polymer Technologies Centre, Ireland, identified techniques for bench top evaluation of radiation sterilisation compliant medical devices, realising a more cost effect method for material selection. David Phelan and Shane McGrath, both from Waterford Institute of Technology, Ireland, gave fine papers in the area of contact lens development and active ingredient encapsulation. Joe Weber from Hampel Corp, USA, posed salient questions towards the power of proprietary products and the considerations of engaging with contract moulding companies, and the need for collaborative and symbiotic relationships where open innovation is now necessary to advance into higher value areas of technology. Wireless active implantable medical devices are gaining increased traction from research bodies and will be critical to the future of medical device development. Radoni Mario from the Polytechnique University of Marche, Italy addressed the use of long term implantable polymers for encapsulation of electronic devices.

The medical plastics and polymers section of the EuroTec conference was very well attended. Feedback from the attendees was very positive in terms of the organisation, location, and very high quality of papers presented. The biggest gain reported was the networking functions and contacts developed. These days, in all industries, the key to success is strong knowledge networks. The Society of Plastics Engineers is home to more than 20,000 plastics professionals in more than 70 countries around the world. It is the "go to" resource for plastics technical information, business advice and knowledge transfer.

*Austin Coffey*



**Presenters José Ramon Sarasua, Austin Coffey, Séan Lyons (above) and Susana Petisco (right).**

**SPE Medical Plastics Division and  
Chicago & Milwaukee Sections Present  
MEDICAL PLASTICS MINITEC 2013**



Society of Plastics Engineers

**Technology Advances in Plastic Materials and  
Processing for Medical Devices**

**New Materials**



**High Performance Polymers**  
*Ryan Roeder - University of Notre Dame*



**Silicone Biomaterial Applications:  
Past, Present and Future**  
*Alexis Proper - PolyOne Corporation*



**Specialty Polymer Solutions for a  
Changing Healthcare Landscape**  
*Dane Waund – Solvay Specialty  
Polymers*



**PEEK in Medical Implant  
Applications**  
*Kenneth Ross – Evonik Corporation*



**Openair® Plasma Improves Adhesion of LSR to  
Medical Grade Polymer Substrate Materials**  
*Jeff Leighty – Plasmatreat*



**Fluoropolymers in Healthcare  
Applications**  
*John Felton – Daikin – America*



**Polycarbonate Resins for Medical Applications:  
Today and Tomorrow**  
*Pierre Moulinie – Bayer Material Science LLC*



**A Multi-Pronged Approach to Meeting  
HAI Challenges with  
Specialty Engineered Thermoplastics**  
*Lynn Colucci Mizenko – SABIC*  
*Manish Nandi - SABIC*

On Monday, 09 Sep 2013, more than 100 people participated at the SPE MiniTec, a one-day, no frills technical conference sponsored by the Medical Plastics Division in conjunction with the Chicago and Milwaukee regional sections of the SPE. There were 14 presentations on both the latest in materials technology and advances in polymer processing for the medical device industry.

Several speakers discussed the progress being made by suppliers to meet the needs of an ever changing industry with high performance polymers. These high performance polymers are suitable for both implantable devices but also for durable applications such as pump housings, instruments and diagnostics. The battle to reduce or eliminate Hospital Acquired Infections (HAIs) requires new cleaning and disinfecting procedures with frequently more aggressive chemical solutions. These products challenge the materials of construction especially for long-term use products such as those used in the OR (operating room). The growth of home healthcare further challenges device companies and all the associated support industries to come up with products that can be safely and effectively used in the home setting often by non-technical family members of the patients. *(continued)*

## **New Processing Technologies**



### **Exciting, New Extruded Tubing Materials For Medical Applications**

*Jessica Lenhardt –  
Teleflex Medical OEM*



### **Advantages of Co-Extrusion for Use in Medical Tubing**

*Tom Thompson – Teel Plastics*



### **PET: A Sustainable Material for Medical Packaging Applications**

*Scott Steele –  
Plastics Technologies Inc.*



### **Why Your Perfect Mold and Process Produces Imperfect Parts**

*David Rose - Beaumont*



### **Advanced Process Controls for Injection Molding**

*Susan Montgomery –  
Priamus Systems*



### **Seeing Beyond the Surface: How CT Scanning Redefines Industrial Metrology**

*Tom Casali – NyproMold Inc.*



### **Organizer and Moderator:**

*Len Czuba – Czuba Enterprises*

In meeting the needs of device manufacturers, tubing extrusion companies are coming up with value added options such as coextruded multi-layer structures and unique material offerings for the device industry. We heard how surface treatment with ionized plasma can improve surface adhesion, printing and bonding or improved overmolding and materials compatibility.

Two presentations on advance processing offered interesting techniques to improve the injection molding operation. The closing speaker of the MiniTec gave a most interesting presentation on how CT (computed tomography) scanning can be used in product development, manufacturing, and process monitoring. Originally intended for use in hospital diagnostics for human patients, the system was modified and now used to image plastic parts at the injection molding company. It makes analyzing complex forms possible with a degree of accuracy unparalleled by OGP (optical gauging product) or by CMM (contact measuring machine).

The conference program was followed by a surprisingly large and well attended dinner featuring Steve Goreham as speaker.

*Len Czuba*



# Upcoming Conferences and Activities



Society of Plastics Engineers

December 11-12 | Shanghai, China

## SPE Medical Plastics Conference in China 2013

Shanghai Marriott City Centre  
No. 555 Xizang Middle Road Huangpu District,  
Shanghai 200003  
China Phone: +86 800 228 9290

### **SPE TOPCON 2013 China Plastics Conference Medical Devices & Packaging 2013**

The Medical Plastics Division of SPE invites you to present topics of interest which may include but not limited to the following categories:

**Products**- Devices for Medical, Biomedical, Drug Delivery, One Time Use, etc.  
•Research and Development  
•Design  
•Application  
•Patents, Regulations, Standards, Certifications, and Approvals  
•Technical and Financial Merits, Partnership, Funds and Investments

**Advanced Manufacture**  
•Process and Bioprocess  
•Equipment  
•Materials (Polymers, Biopolymers, Additives, and Biopharma Additives)  
•Analytical Testing and Compliance

Go to the SPE website [www.4spe.org](http://www.4spe.org) and search on "TOPCON 2013 in China" for complete information.

SOCIETY OF PLASTICS ENGINEERS

# ANTEC DUBAI 2014

## *Call for Papers*

**21-22 January, 2014**  
**JW Marriott Marquis Hotel**  
**Dubai, UAE**

The Society of Plastics Engineers (SPE) invites you to share your latest research and present a paper at its first technical and business conference in the Middle East – ANTEC® Dubai. This two-day event will be attended by several hundred industry professionals who are keen on learning about the latest developments and exciting innovations in plastics happening both globally as well as in the Gulf region.

SPE is inviting speakers to present at this conference in the following areas:

- **Materials:** Polymers in Medical Devices, Bioplastics, Composites, Aerospace, Automotive
- **Processing:** Extrusion, Injection Moulding, Blow Moulding, Thermoforming, Film, Rotational Moulding
- **Materials Performance:** Design Innovation, Engineering Properties and Structure, Polymer Modifiers and Additives, Polymer Composites, Failure Analysis, Polymer Blends, Recycling, Standards and Specifications
- **Machinery:** Design of Screws, Barrels, Mixing Equipment, Down-Stream Equipment, Hydraulic, All-Electric, Control System, Robotics, Other Plastics Processing Machines
- **Rheology, Modeling and Simulation:** Flow behavior of polymers, Rheological Models, Analysis of Modeling of Processes, Theoretical Models and Co-Relations

We request an abstract (**maximum 100-words**) outlining the topic of your paper. You will be notified by October 24th if your abstract topic is accepted. If you wish to be published in the proceedings collection and the Society's online technical library, you will be contacted and asked to submit a 5-6 page technical paper. Your presentation time will be 30 minutes; all presentations will be in English.

[Please submit your abstract online](#)

(NOTE: You must log in to the SPE website to submit an abstract.

If you do not have a log-in to the SPE site, please use the

[New Visitor Registration](#) to register for the site.)

**Paper Submission Deadline:**

**October 12, 2013**

# *Medical Plastics Division*



## **Mission Statement**

***To promote the Medical Plastics Division of the Society of Plastics Engineers through outreach, networking, and education about our fascinating and vital industry. To encourage participation of everyone from the MPD Board and from the Division to help shape our message and to encourage others to join us in this mission.***

## **Goals and Objectives 2013 - 2014**

### **Leadership Development**

Communicate about our industry through outreach, education, and networking. Encourage MPD Board members and division members to actively participate in the Division and SPE. Identify new board prospects, mentor those new to the board. Initiating new MPD programs to benefit members and prospective members of SPE. Be respectful of everyone's opinions.

- Fill all positions on board.
- Have each BOD member identify a successor and mentor that person.
- Hold 6 Conference Calls as a Board during MPD 2013-2014 Calendar year.

### **Technical Programming**

Maintain or increase MPD level of participation at ANTEC, including joint sessions with other divisions.

Continue to partnership with UBM Canon for MDM shows.

Develop a speakers list for division.

Continue support of TopCon for 2013.

Support and participate in the EuroTec and AsiaTec conferencing efforts.

### **Communications Program**

Publish at least three issues of the Medical Plastics Division newsletter of high quality content with news of activities and interest to our members.

Use the website for better communication about MPD activities and volunteers.

Utilize SPE monthly email blasts to reach out to members with news and to promote activities.

### **Finance Committee**

Determine effective use of MPD funds to support an operating budget as well as member programs, benefits, and student support.

Develop long-range plans for use of funds including annual budget and to raise income.

### **Membership**

Appoint a membership chair to develop a communication program, to recognize new members, and to reach out to potential new members. Increase division membership by 5%.

### **Recognition**

Use Awards program to recognize contributions from conference speakers and student papers. Work with programming committee to identify and recognize best speaker at each conference.

Nominate and sponsor at least one member for either Honored Service Member or Fellow from our division.

Use division awards to recognize significant contributions.



**SOCIETY OF PLASTICS ENGINEERS INC.**  
**MEDICAL PLASTICS DIVISION**

## Sponsors...

We are now seeking Sponsor Display Ads for our Award-winning Division Newsletter! To show your support of the Society of Plastics Engineers and in particular, the Medical Plastics Division Newsletter, please consider taking part in this important communication effort.

### **Sizes Available** (Full year amount, i.e. 3 issues)

Full page (8½" X 11")	\$3,000
Half page	\$1,600
Quarter page	\$900
Eighth page	\$500

The newsletter is published electronically at least **three times per year**. Every Medical Plastics Division member, about **1,000**, receives a copy mailed directly to their listed address. And additional copies are also circulated in our continuing effort to reach new and prospective members and other interested individuals.

To show your support please contact Norris M. Tollefson (newsletter editor) at 678-415-3784 (Internet: [Norris.tollefson@cibavision.com](mailto:Norris.tollefson@cibavision.com)) with your copy (jpg preferred) and payment.

Or contact MPD Chair Mark Bonifacio at 310-683-3257 (Internet: [mark@bonifacioconsulting.com](mailto:mark@bonifacioconsulting.com)) for more information.

Thank you for your support!

# ***Medical Plastics Division - SPE Board of Directors for 2013 - 2014***

<b>Name</b>	<b>2012-2013 Position</b>	<b>Company</b>
<b>Officers</b>		
Mark Bonifacio	Chair	Bonifacio Consulting
open	Vice Chair	
John Thomas	Secretary	Bonifacio Consulting
Paul German	Treasurer	Kruger Plastics
Margie Hanna	Councilor (2012 - 2015)	Czuba Enterprises, Inc.
Jill Martin	Past Chair (2012 - 2013)	Dow Chemical
<b>Board Members</b>		
<b>Class ending ANTEC 2014</b>		
Norris Tollefson	Newsletter Editor	Alcon Laboratories, Inc.
Jim Madenjian	Membership	J.M. Engineering Associates
Harrison Yu	Website Communications / Pinnacle	Bondable Biopolymers
Jordan Freedman	Technical Program Committee	Biomet Orthopedics
<b>Class ending ANTEC 2015</b>		
Jodie Laughlin	Marketing - To be chartered	GE Healthcare
Maureen Reitman	Awards / Technical Program	Exponent
Ken Breeding	Marketing - To be chartered	Eastman Chemical Company
James Oberhauser	Technical Program Committee	Abbott Vascular
Ali Ashter	Technical Program Committee	EMD Millipore
<b>Class ending ANTEC 2016</b>		
John Thomas	Secretary	Bonifacio Consulting
Ed Fewkes	Technical Program ANTEC	Corning Inc
Ben Poon	Technical Program Committee	Baxter Healthcare
Len Czuba	Technical Program Committee	Czuba Enterprises Inc
Michael Wallick	Awards Committee	Invibio Biomaterial Solutions
Vipul Dave	Technical Program Committee	McNeil Consumer Healthcare
<b><i>ex officio</i></b>		
Glenn Beall	Historian (Appointed)	Glenn Beall Plastics
Sarah Sullinger	SPE Liaison (Appointed)	SPE
Vijay Boolani	EC Liaison (Appointed)	Boolani Engineering Corporation
Gerry McNally	EMPD TPC	McNally Associates
Austin Coffey	EMPD Chair & Councilor	Waterford Institute of Technology

***If you would like to get in touch with a member of the board, contact information may be found in the SPE Membership Directory.***

# *Board of Directors for the Medical Plastics Division*

## **Returning Board Members for 2013 – 2014.**



Jordan Freedman



Harrison Yu



Glenn Beall



Maureen Reitman



Ed Fewkes



Jim Madenjian

## **Requirements and Responsibilities of Board Members for the Medical Plastics Division**

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- ▶ Candidates for the SPE Medical Plastics Division Board of Directors must be active members of the Society of Plastics Engineers and of the Medical Plastics Division.
- ▶ Members of the Board should be involved in or have interest in some aspect of the Medical Plastics Business or a related academic field.
- ▶ Board members are expected to participate in monthly 1-hour teleconference meetings and annual in-person Board of Directors and Business meetings at SPE's Annual Technical Conference (ANTEC).
- ▶ Board members are expected to assume responsibility for specific duties, such as Secretary, Newsletter, Web-Site, Social Activities, Technical Program Chair, Membership, Student Activities, Treasurer and SPE-Council Representative.
- ▶ Board members are expected to participate in committees in some capacity to support activities such as Technical Conferences, Membership Group Activities, Financial oversight, BOD nominations, etc.
- ▶ We encourage an active membership so any one individual doesn't carry too much of a load.

## Meeting Minutes for MPD BOD meeting

Date: June 19 11 a.m EST conference call

Call to order – Motion: Margie, 2<sup>nd</sup> by several on the line.

Roll Call - voice check, welcome new BOD and new officers, + all in attendance. – 5-10 minutes

Attendees: Mark Bonifacio, John Thomas, Norris Tollefson, Len Czuba, Margie Hanna, Glenn Beall, Steve McCarthy, Jordan Freedman, Michael Wallick, Vipul Dave, Ben Poon, Maureen Reitman, Ali Ashter, Ken Breeding, Paul German

Minutes:

- 1) Approval of meeting minutes from ANTEC mtg. Approved Motion & Second.
- 2) Treasurer's report
  - a. Paul G presented balances
  - b. Unchanged from last meeting
  - c. Finance committee participation clarification - transparency
  - d. Schedule of next finance committee meeting – Conf Call 9/4
- 3) Technical program
  - a. MiniTech – Monday Sept 9 Gurney
    - i. Update – Len C
  - b. 2014 Las Vegas – Ed Fewkes –
    - i. Inj. Molding requested a Joint Session
    - ii. Ed needs assistance printing certificates for speakers
    - iii. Other requests for Joint sessions
  - c. TOPCON China Update – Harrison L, Len C, Ali A, Vipul D, Steve McCarthy
    - i. will send separate email
    - ii. Trip to Shanghai
    - iii. Still looking for 15 papers – Call for Papers
- 4) Membership
  - a. Forming Committee – Mark open to participation 2-3 members?
- 5) SPE Leadership Update – Same as ANTEC BoD meeting
- 6) Councilor Report – Margie Hanna
  - i. No changes since last meeting
  - ii. Conference Calls?
- 7) Newsletter update – Norris T
  - a. Will Publish in June 30
    - i. Send Content
  - b. Will use old rates, annually a donation with ad rights
    - i. Len has rates
  - c. Favorite Papers? Let Norris know by the end of the week
  - d. MD&M East – Mark/Vipul for Fall issue
  - e. Send out scope as written by NMT
- 8) Liaisons – EMPD, EC, Packaging Professionals, SPI, etc. – none on the call
- 9) Unfinished business
  - a. Award nominations Assemble a committee
    - i. Michael – Awards, Criteria, some on the website are discontinued
    - ii. Applications are Due Sept/Oct, should be well written – Michael to lead
    - iii. Budget for guest speaker awards/gifts – Ben researching
- 10) New business
  - a. Conference Calls Schedule – Invites
  - b. Ali volunteered to support Vipul on MD&M West 2014
- 11) Closing Remarks – Next Meeting – Thank You to Everyone for your time, talent and efforts.
  - a. NEXT MEETING – Calendar notices going out

## Meeting Minutes for MPD BOD meeting

Date: 9/16/13 11 am EST

Call to order

Roll Call - voice check, welcome new BOD and new officers, + all in attendance. – 5-10 minutes

Attendees: Len Czuba, Mark Bonifacio, John Thomas, Jim Madenjian, Steve McCarty, Michael Wallick, Ken Breeding, Ben Poon, Austin Coffey, Ali Ashter, Maureen Reitman, Jordan Freedman, Norris Tollefson, Ed Fewkes, Glenn Beale

Vipul & Harrison – Not on the call

Meeting Called to order by Paul German, seconded

Minutes:

- 1) Approval of meeting minutes from 6/19 conf call. – postponed until next meeting.
- 2) Treasurer's report
  - a. MiniTec Gurney – \$2046.46 income not on treasurer's report. Paul G to add.
  - b. TOPCON China
    - i. Expenses: Est. \$3,000
    - ii. Income Unknown
  - c. Budget Approved
  - d. Len: Finance committee consider returning the rebate to SPE – Next Finance Committee meeting
- 3) Technical program
  - a. MD&M Philadelphia Sessions
  - b. MD&M Anaheim
    - i. One Day Session in planning stages, update next meeting- Vipul
  - c. Mini Tech, Gurney
    - i. Co-hosted by Chicago & Milwaukee
    - ii. 113 people, 23 exhibitors, 65 people at the dinner
    - iii. Well received
    - iv. Special thanks to Kim Rush for her efforts supporting the Mini Tech
  - d. 2014 Las Vegas – Ed Fewkes
    - i. Had 1<sup>st</sup> meeting and sent out call for papers
    - ii. Ali, Vipul, Ben, Austin, Maureen will help reading and critiquing the papers – October 25<sup>th</sup> Deadline
    - iii. Injection molding Section may be interested in Joint session
    - iv. Do we want to have a Plenary Speaker?
    - v. Polymer Analysis section is also interested in a joint session
  - e. TOPCON China Update – Harrison L, Len C, Ali A, Vipul D, Steve McCarthy
    - i. Expenses: Est. \$3,000
    - ii. Income?
    - iii. Could use a couple more papers – Maybe some new submissions
    - iv. Looking for Sponsorships
- 4) Membership
  - a. Forming Committee – Lead?
- 5) Councilor Report – Margie Hanna
  1. HQ working out bugs on the website, but it is open to try it out
  2. Next meeting 15-16 in San Diego
  3. Margie suggests that MPD supports Dubai
    - a. Ali makes a motion for \$1500 to support, Ed Fewkes 2<sup>nd</sup>. Motion carried.

- 6) Newsletter update – Norris T
  - 1. Targeting Sept 30 for publishing Q4 newsletter
  - 2. Add MD&M call for papers & Topcon info
  - 3. Suggests that anyone sponsored for conference attendance should prepare a review of the conference (250 words with photos)
  - 4. Should we have a communications committee? Beyond the newsletter – Jordan will help.
- 7) Liaisons
- 8) Award nominations committee Michael & Ben
  - a. Gifts: Motion to purchase 100 laser pointer pens carried
  - b. Applications are Due Sept/Oct, should be well written – Michael to lead
  - c. Sarah Sullinger will stay on part time with SPE through the end of 2013
- 9) Unfinished business
  - d. Skipped
- 10) New business
  - a. Len – Asked to participate in Polyolefins conference and we have until the end of Sept to reply
  - b. The future of Polyolefins in Medical? PVC Replacement?
  - c. Motion to participate pending the assignment of a leader was carried.
- 11) Meeting adjourned

## MEDICAL PLASTICS DIVISION-S.P.E.

### Treasurer's report as of 18 SEP 2013

#### INCOME

SPE Rebate, 3Qtr	\$1,033.75
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#### EXPENSES

Council expenses

Funds available: 04 SEP 2013	\$33,939.91
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PAUL G. GERMAN, TREASURER

04-SEP-13

# Synthesis and characterisation of PVA/SBMA crosslinked hydrogels with low fouling property

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## Abstract

A novel zwitterionic poly(vinyl alcohol)/ sulfobetaine methacrylate (PVA/SBMA) crosslinked hydrogel was prepared by a two-step aqueous polymerization method, to improve the anti-protein fouling inadequacy of PVA hydrogels. Attenuated total reflectance-Fourier transform infrared spectroscopy (ATR-FTIR) and scanning electron microscope (SEM) were used to study the composition and microstructure of the hydrogel samples. The swelling behaviors and adsorption of bovine serum albumin (BSA) on the prepared PVA/SBMA hydrogel were measured as a function of ionic strength. The results showed PVA/SBMA hydrogel significantly reduced protein adsorption.

## Keywords

Poly(vinyl alcohol) (PVA); sulfobetaine methacrylate (SBMA); hydrogel; protein adsorption

## Introduction

Poly(vinyl alcohol)(PVA), an avirulent and biocompatible synthetic polymer, has been extensively applied in medical fields, such as wound dressing, biomedical materials and drug delivery materials. The excellent performances of PVA have made PVA-based hydrogels the candidate biomaterials for articular cartilage resurfacing or replacement [1-4]. However, when used as the biomedical implants such as artificial meniscus, PVA hydrogels suffer from a considerable degree of protein-fouling [5]. It has been universally recognized that protein attaching onto the implant surface is the first event happening in blood-biomaterial interface, followed by platelet adhesion and activation. Platelet activation may result in thrombosis and platelet aggregation and bacterial infection [6, 7]. The properties of implants would be affected, which might lead implant-materials to be taken out and replaced with new one. Therefore, it is desirable to develop a low protein-fouling PVA hydrogel for medical material applications.

Recently, polybetaine materials exhibited a significant reduction in protein adsorption and long-term biofilm formation (fibrinogen adsorption < 0.3 ng/cm<sup>2</sup>) [7-9]. Poly(sulfobetaine methacrylate) (polySBMA), one of the poly-betaines with cationic and anionic groups on

the same monomer unit, had been shown to be highly resistant to protein adsorption in fibrinogen solution of 1.0 mg/mL in PBS (0.15 M, pH 7.4) [10-12], which is mainly attributed to the large repulsive hydration force near the surface. And the surface hydration via electrostatic interactions and hydrogen bonding is mainly responsible for the large repulsive force to prevent protein adsorption [13,14]. Thus, if SBMA is employed to synthesize a novel PVA/SBMA crosslinked hydrogel, this hydrogel should be able to achieve low protein-fouling property.

In this study, we prepared ampholytic PVA/SBMA crosslinked hydrogel via two-step aqueous polymerization method. The hydrogels were characterized by FTIR and SEM. Because ionic strength is the critical factor affecting the hydrogel's properties [15], swelling behaviors and anti-protein fouling property of PVA/SBMA hydrogels were investigated in solutions with different salt concentrations.

## Experimental

### Materials

Poly(vinyl alcohol) (PVA, Mw = 26,000) was purchased from Shanghai Petrochemical Co. Coomassie brilliant blue G-250 was obtained from Aladdin Chemicals (Shanghai, China). Bovine serum albumin (BSA; pI = 4.8, Mw = 66,000) was obtained from Shanghai Chenda Med-Tech Co. Ltd. N,N'-methylene-bisacrylamide (MBAA) was purchased from Tianjin Kermel Chemical Reagent Co. Ltd. Ammonium persulfate (APS) was purchased from Sinopharm Chemical Reagent Co. Ltd. N-(3-sulfopropyl)-N-(methacryloxyethyl)-N,N-dimethylammonium betaine (SBMA) was offered by Changzhou Yipingtang Chemical Reagent Co. Ltd.

### Synthesis of PVA/SBMA hydrogels

PVA and SBMA were dissolved in distilled water to prepare 4 wt% PVA and 10 wt% SBMA aqueous solution. APS (4.8 wt%) was added to SBMA solution with constant stirring at 80 °C and mixture was stirred for 10 min to get a precursor. Then the precursor was added into PVA solution prior to the addition of the initiator of APS (1.6% to all monomers), 4.8 wt% MBAA based on the

weight of PVA and MBAA was added into the mixture under stirring to crosslink for 1 h. The mixture solutions were transferred into moulds and frozen at  $-20^{\circ}\text{C}$  for 20 h and then thawed at room temperature ( $25^{\circ}\text{C}$ ) for 4 h. This freezing-thawing cycle was repeated additional 5 times. The general procedure was shown in Scheme 1. The resultant hydrogels were immersed in distilled water for further use.

### Characterization of PVA/SBMA hydrogel

Attenuated total reflectance -Fourier transform infrared spectroscopy (ATR-FTIR) with Bruker Vector33 spectrophotometer was used to evaluate the chemical compositions of the hydrogels in the range of  $4000\text{--}600\text{ cm}^{-1}$ . Scanning electron microscope (SEM, LEO 1530VP, Germany) was used to characterize the morphology and microstructure of samples.

### Swelling properties of hydrogels

The swelling behaviors were studied in NaCl solutions ranging in concentration from 2.0 wt% to 10.0 wt%. Rectangular samples were transferred to each of the salt solutions and were allowed to swell. The mass of samples was measured when hydrogels were swollen to equilibrium. The equilibrium swelling ratio was computed according to the following equation:

$$\text{ESR}(\%) = \frac{m_e - m_d}{m_d}$$

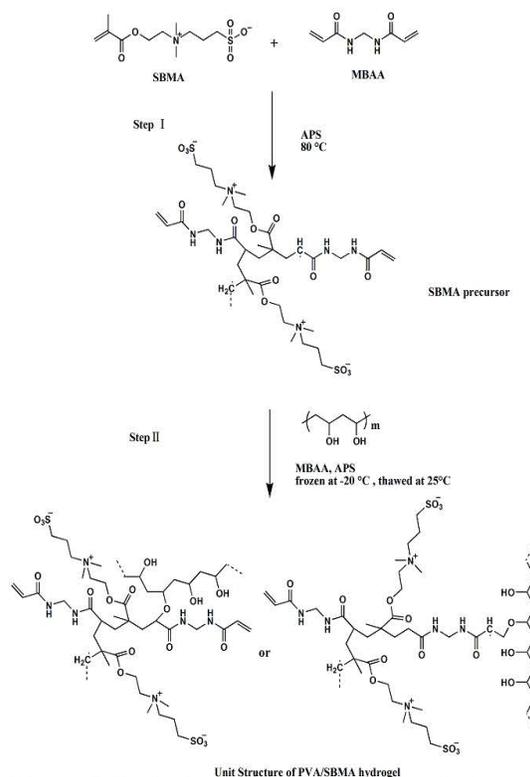
Where  $m_e$  and  $m_d$  represent the mass of the equilibrium swollen and dried hydrogel, respectively. All samples were measured in triplicate.

### Protein adsorption studies

A Bio-Rad Protein Assay was used to evaluate the protein adsorption of the zwitterionic hydrogels. To study the effect of ionic strength on protein adsorption on hydrogels, samples ( $0.5\text{ cm} \times 0.5\text{ cm}$ ) were soaked in phosphate buffered solution (PBS, 0.01M, 20mL) overnight. Then the samples were transferred into 5mL bovine serum albumin (BSA, 1.0 mg/mL) solutions which were prepared with salt solutions with concentrations from 8.0 wt% and 10.0 wt% for 24 h at  $37^{\circ}\text{C}$ . The hydrogels were removed from BSA solutions, followed by the addition of the colouring agent (coomassie brilliant blue G-250) into the solutions. The protein concentrations of the solutions were determined by using an ultraviolet spectrometer (UV-2450) to measure the absorption at 595 nm. The calibration curve was pre-set by measuring the solutions with varying protein concentrations. The relative protein adsorption of the hydrogels could be calculated by the following equation:

$$\text{Relative protein adsorption}(\%) = \frac{C_0 - C_1}{C_0} \times 100\%$$

Where  $C_0$  and  $C_1$  are BSA concentration (mg/mL) before and after sample was immersed in solution. All samples were measured in triplicate.



Scheme 1 Synthesis of PVA/SBMA hydrogel via two-step aqueous polymerization.

## Results and discussion

### FTIR characterization

Figure 1 displays the ATR-FTIR spectra for PVA, SBMA and PVA/SBMA hydrogels. The characteristic adsorption peaks of  $3295\text{ cm}^{-1}$  and  $847\text{ cm}^{-1}$  in Figure 1(a) represent  $-\text{OH}$  stretching vibration adsorption and  $-\text{C}-\text{H}$  swing vibration in PVA. And as is shown in Figure 1(d), the characteristic peaks at  $1168\text{ cm}^{-1}$  and  $1036\text{ cm}^{-1}$  are contributed by  $\text{SO}_3^-$ . The peak at  $963\text{ cm}^{-1}$  is characteristic of quaternary ammonium salt ( $\text{N}^+$ ) of sulfobetaine [16]. From the Figure 1, it can be found that the peak of  $\text{SO}_3^-$  is not seen in spectra (a), while it exists in the spectra (b)-(d) and the intensity of the characteristic peak of  $\text{SO}_3^-$  ( $\text{S}=\text{O}$  and  $\text{S}-\text{O}$ ) gradually becomes stronger with the increasing of SBMA content, indicating the presence of  $\text{SO}_3^-$  in PVA/SBMA hydrogel. The peak of  $-\text{C}=\text{O}$  is reinforced as SBMA increases from 33% (relative to the weight of PVA and SBMA) to 100% due to the contribution of ester group from SBMA. The  $-\text{C}=\text{O}$  stretching vibration shifted from  $1722\text{ cm}^{-1}$  in pure (100%) SBMA to  $1713\text{ cm}^{-1}$  in 0% SBMA, showing a new inter-molecular interaction exist between the carbonyl group on a SBMA chain and a hydroxyl group on a PVA chain [17].

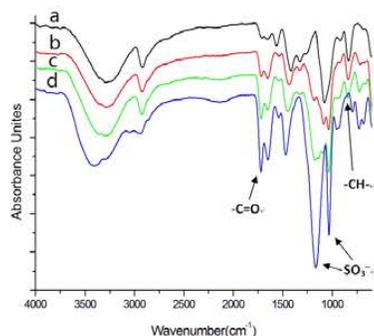
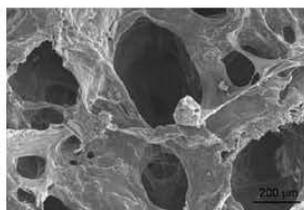


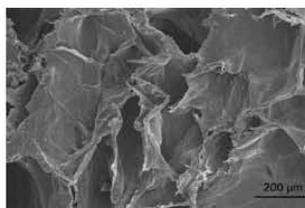
Figure 1 FTIR spectra of PVA, PVA/SBMA and SBMA hydrogels: (a) for pure PVA (0 % SBMA), (b) for 33 % SBMA, (c) for 50 % SBMA, (d) for pure SBMA.

### SEM observations

Scanning electron microscopy (SEM) was used to examine the microstructures of PVA and PVA/SBMA hydrogel containing 33% SBMA. All of them were freeze-dried for 24 h before SEM observations. The SEM micrographs illustrated in Figure 2 exhibit the relationships between pore size and the addition of SBMA. PVA gel shows internal three-dimensional network structure with large pore sizes in Figure 2(a). However, after SBMA is introduced into the gel [Figure 2(b)], the pore sizes of the sample change and seem to reduce significantly as compared to the PVA gel, showing the addition of SBMA exercises a great influence on the size of pore. That's probably because PVA is a hydrophilic polymer, which contains more hydrophilic groups than those of SBMA. So PVA hydrogel absorbed more water (higher swelling ratio, which is shown in Figure 3) than PVA/SBMA hydrogel in purified water and the water uptake decreases with the addition of SBMA. Usually, bound water contained in hydrogel directly affects the size of pore. For this reason, evaporation of more water will enlarge the pore size of hydrogel during freeze-drying process.



(a) The pure PVA hydrogel



(b) The PVA/SBMA hydrogel

Figure 2 SEM micrographs of the PVA hydrogel and PVA/SBMA hydrogels.

### Swelling studies of PVA/SBMA hydrogels

The swelling behaviors of PVA, PVA/SBMA hydrogel with 33% SBMA contents were measured in NaCl solutions ranging in concentrations from 0% to 14.0%. The mass of samples were weighed when hydrogels attained swelling equilibrium. Figure 3 shows a comparison of swelling behaviors in aqueous NaCl solutions for PVA hydrogel and PVA/SBMA hydrogel. It can be seen that these two hydrogels exhibit different deswelling behaviors in response to ion strength change. The swelling of PVA hydrogel showed a fast downward trend as NaCl concentration increased from 0% to 10%. While PVA/SBMA hydrogel exhibited a smooth shrinking in response to increasing NaCl concentration.

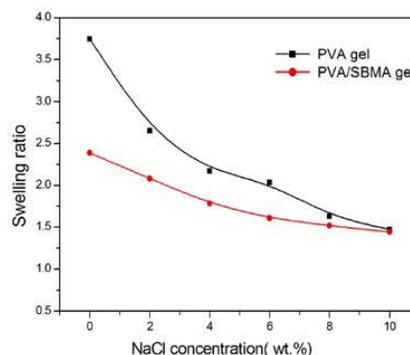


Figure 3 Comparison of equilibrium swelling ratio in aqueous NaCl solutions for PVA and PVA/SBMA hydrogels.

From Figure 3, we observe both PVA gel and PVA/SBMA gel show a shrinking rate in response to an alteration of ionic strength, and the shrinking rate of the PVA/SBMA gel is much slower than PVA gel, making the surface of the PVA/SBMA gel less hydrophobic in high ionic strength media. This can be explained by the fact that more unblocked pores exist in PVA gel than PVA/SBMA gel so that osmotically active ions can easily permeate into hydrogel interior, which may change the structure of water molecule around hydrogels and impair the water solubilizing effect of the hydrophilic groups. Abundant ions inside the PVA hydrogel make the polymer chains become curly and render PVA gel less hydrophilic than PVA/SBMA gel [18].

### Protein adsorption of PVA/SBMA hydrogels

PVA hydrogels and PVA/SBMA hydrogels with 33% SBMA content were chosen for protein adsorption test in salt solutions with concentrations of 8 wt% and 10 wt%. BSA was selected as a model protein in this study. As can be seen from Figure 4, the protein adsorption of PVA/SBMA hydrogel is 8.0 % in 8 wt% salt solution, much lower than that of PVA hydrogel. And it drops to

1.0% when salinity increases to 10%, suggesting PVA/SBMA hydrogel exhibits an excellent lowfouling property in high salinity. As mentioned above, PVA/SBMA hydrogel shows a little shrinking to ionic strength, so the surface of the gel can keep hydrophilic, allowing water to bind tightly with SBMA to form a hydration layer, which prevents protein from adsorbing on the surface of the gel. In addition, the ability to resist protein adsorption in high salinity is also dominated by ionic atmosphere. SBMA, a monomer with cationic and anionic group on the same unit, attracts large amounts of ions and forms ionic atmosphere on the surface to reduce protein fouling. The increase in salinity leads to the increase of the ionic atmosphere and the repulsive electrostatic interactions between the protein and the PVA/SBMA hydrogel [19].

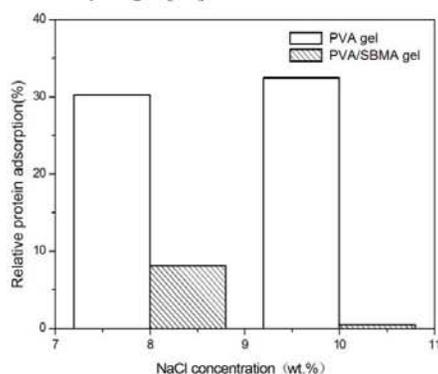


Figure 4 Relative protein adsorption of PVA and PVA/SBMA hydrogels in solutions with different NaCl concentration.

## Conclusion

A novel amphoteric PVA/SBMA cross-linked hydrogel was prepared by repeated freezing and thawing method using SBMA precursor reacting with PVA and a crosslinker. ATR-FTIR measurements revealed the well composite of SBMA and PVA in the hydrogel. SEM characterization indicated the porous structure of PVA/SBMA hydrogel collapsed with the addition of SBMA. The collapsing pores made PVA/SBMA hydrogel become less sensitive to the change of ionic strength. Protein adsorption tests indicated PVA/SBMA hydrogel is significantly resistant to protein fouling in high salinity compared with PVA hydrogel. The results showed a good prospect in acquiring an anti-protein-fouling hydrogel in biomedical material applications.

## Acknowledgment

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