

# Soft Matter

Where physics meets chemistry meets biology for fundamental soft matter research

[rsc.li/soft-matter-journal](https://rsc.li/soft-matter-journal)

The Royal Society of Chemistry is the world's leading chemistry community. Through our high impact journals and publications we connect the world with the chemical sciences and invest the profits back into the chemistry community.

## IN THIS ISSUE

ISSN 1744-6848 CODEN SMOABF 19(41) 7861-8042 (2023)



### Cover

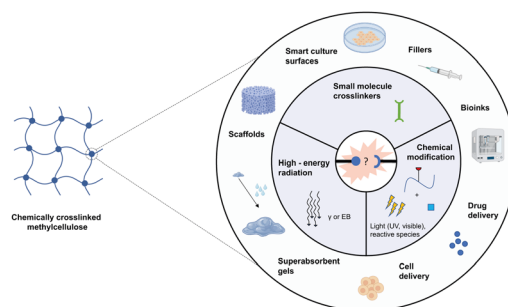
See LaShanda T. J. Korley *et al.*, pp. 7912–7922.  
Image reproduced by permission of LaShanda Korley from *Soft Matter*, 2023, **19**, 7912.  
Image credit: Kelly Walker

## REVIEW

7869

### Crosslinking strategies in modulating methylcellulose hydrogel properties

Lorenzo Bonetti,\* Luigi De Nardo and Silvia Farè\*

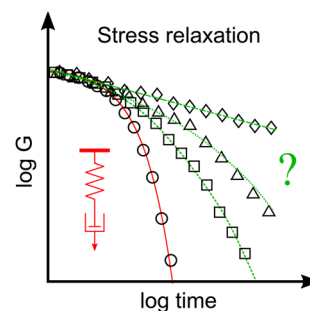


## TUTORIAL REVIEW

7885

### Non-Maxwellian viscoelastic stress relaxations in soft matter

Jake Song,\* Niels Holten-Andersen and Gareth H. McKinley\*



## Editorial Staff

### Executive Editor

Maria Southall

### Deputy Editor

Laura Ghandhi

### Editorial Production Manager

Chris Goodall

### Assistant Editors

Sean Browner, Molly Colgate, Paul Scott, Alison Winder

### Editorial Assistant

Basita Javeed

### Publishing Assistant

Allison Holloway

### Publisher

Sam Keltie

For queries about submitted papers, please contact Chris Goodall, Editorial Production Manager in the first instance. E-mail: [softmatter@rsc.org](mailto:softmatter@rsc.org)

For pre-submission queries please contact Maria Southall, Executive Editor. E-mail: [softmatter-rsc@rsc.org](mailto:softmatter-rsc@rsc.org)

Soft Matter (electronic: ISSN 1744-6848) is published 48 times a year by the Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, UK CB4 0WF.

All orders, with cheques made payable to the Royal Society of Chemistry, should be sent to the Royal Society of Chemistry Order Department, Royal Society of Chemistry, Thomas Graham House, Science Park, Milton Road, Cambridge, CB4 0WF, UK

Tel +44 (0)1223 432398; E-mail: [orders@rsc.org](mailto:orders@rsc.org)

2023 Annual (electronic) subscription price: £1641; \$2891. Customers in Canada will be subject to a surcharge to cover GST. Customers in the EU subscribing to the electronic version only will be charged VAT.

If you take an institutional subscription to any Royal Society of Chemistry journal you are entitled to free, site-wide web access to that journal. You can arrange access via Internet Protocol (IP) address at [www.rsc.org/ip](http://www.rsc.org/ip)

Customers should make payments by cheque in sterling payable on a UK clearing bank or in US dollars payable on a US clearing bank.

Whilst this material has been produced with all due care, the Royal Society of Chemistry cannot be held responsible or liable for its accuracy and completeness, nor for any consequences arising from any errors or the use of the information contained in this publication. The publication of advertisements does not constitute any endorsement by the Royal Society of Chemistry or Authors of any products advertised. The views and opinions advanced by contributors do not necessarily reflect those of the Royal Society of Chemistry which shall not be liable for any resulting loss or damage arising as a result of reliance upon this material. The Royal Society of Chemistry is a charity, registered in England and Wales, Number 207890, and a company incorporated in England by Royal Charter (Registered No. RC000524), registered office: Burlington House, Piccadilly, London W1J 0BA, UK, Telephone: +44 (0) 207 4378 6556.

### Advertisement sales:

Tel +44 (0) 1223 432246; Fax +44 (0) 1223 426017;

E-mail: [advertising@rsc.org](mailto:advertising@rsc.org)

For marketing opportunities relating to this journal, contact [marketing@rsc.org](mailto:marketing@rsc.org)

# Soft Matter

[rsc.li/soft-matter-journal](http://rsc.li/soft-matter-journal)

An interdisciplinary journal focusing on innovative soft matter topics through original research and reviews.

## Editorial Board

### Editor-in-Chief

Alfred Crosby, University of Massachusetts Amherst, USA

### Associate Editors

Roberto Cerbino, University of Vienna, Austria  
Lorna Dougan, University of Leeds, UK

Ewa Górecka, Warsaw University, Poland

Sanat Kumar, Columbia University, USA

Guruswamy Kumaraswamy, Indian Institute of Technology Bombay, India

Zhihong Nie, Fudan University, China

Amy Shen, Okinawa Institute of Science and

Technology, Japan

Lixin Wu, Jilin University, China

Emanuela Zaccarelli, Sapienza University of Rome, Italy

Xuehua Zhang, University of Alberta, Canada

## Advisory Board

Dave Adams, University of Glasgow, UK

Shaun Ahn, Dow, USA

Tommy Angelini, University of Florida, USA

Markus Antonietti, Max Planck Institute of Colloids and Interfaces, Germany

Omar Azzaroni, UNLP, Argentina

Piero Baglioni, University of Florence, Italy

Anna Balazs, University of Pittsburgh, USA

Arindam Banerjee, Indian Association for the

Cultivation of Science, India

Madivala Basavaraj, Indian Institute of Technology

Madras, India

Patricia Bassereau, Physico Chimie Curie Lab,

France

Jasna Bruijic, New York University, USA

Jacinta Conrad, University of Houston, USA

Vincent Craig, Australian National University,

Australia

Emanuela Del Gado, Georgetown University, USA

Jan Dhont, Forschungszentrum Jülich,

Germany

Carmen Domene, University of Bath, UK

Zahra Fakhraai, University of Pennsylvania, USA

Glenn Fredrickson, University of California at Santa

Barbara, USA

Valeria Garbin, TU Delft, The Netherlands

Jian Ping Gong, Hokkaido University, Japan

Ian Hamley, University of Reading, UK

Jianbin Huang, Peking University, China

Lucio Isa, ETH Zurich, Switzerland

Paul Janmey, University of Pennsylvania, USA

Gijje Koenderink, AMOLF, Netherlands Daniela

Kraft, Leiden University, Netherlands

Eugenia Kumacheva, University of Toronto,

Canada

Oleg Lavrentovich, Kent State University, USA

Junbai Li, Institute of Chemistry, Chinese Academy

of Sciences, China

Christos Likos, University of Vienna, Austria

Dongsheng Liu, Tsinghua University, China

Tom McLeish, University of York, UK

Bradley Olsen, Massachusetts Institute of

Technology, USA

Rossana Pasquino, The University of Naples

Federico II, Italy

Susan Perkin, University of Oxford, UK

Sarah Perry, University of Massachusetts Amherst,

USA

Darrin Pochan, University of Delaware, USA

David Quéré, ESPCI, France

Sriram Ramaswamy, Indian Institute of Science,

India

Meital Reches, The Hebrew University of

Jerusalem, Israel

Alejandro Rey, McGill University, Canada

Connie Roth, Emory University, USA

Michael Rubinstein, Duke University, USA

Sam Safran, Weizmann Institute of Science, Israel

Takamasaki Sakai, The University of Tokyo, Japan

Peter Schurtenburger, Lund University, Sweden

Kathleen Stebe, University of Pennsylvania, USA

Joakim Stenhammar, Lund University, Sweden

Howard Stone, Princeton University, USA

Hajime Tanaka, University of Tokyo, Japan

Evelyn Van Ruymbeke, Université Catholique de

Louvain, Belgium

Jan Vermant, ETH Zurich, Switzerland

Petia Vlahovska, Northwestern University, USA

Dimitris Vlassopoulos, University of Crete, Greece

Yilin Wang, Institute of Chemistry, Chinese

Academy of Sciences, China

Catherine Whitby, Massey University of New

Zealand, New Zealand

Tim White, University of Colorado, USA

Duyang Zang, Northwestern Polytechnical

University, China

## Information for Authors

Full details on how to submit material for publication in

Soft Matter are given in the Instructions for Authors (available from <http://www.rsc.org/authors>). Submissions should be made via the journal's

homepage: [rsc.li/soft-matter-journal](http://rsc.li/soft-matter-journal). Submissions: The journal welcomes submissions of manuscripts for publication as Full Papers, Communications, Reviews, Perspectives, Tutorial Reviews. Full Papers and Communications should describe original work of high quality and impact.

Additional details are available from the Editorial Office or

<http://www.rsc.org/authors>

Authors may reproduce/republish portions of their published contribution without seeking permission from the Royal Society of Chemistry, provided that any such republication is accompanied by an acknowledgement in the form: (Original Citation)–Reproduced by permission of the Royal Society of Chemistry.

This journal is © The Royal Society of Chemistry 2023.

Apart from fair dealing for the purposes of research or private study for non-commercial purposes, or criticism or review, as permitted under the Copyright, Designs and Patents Act 1988 and the Copyright and Related Rights Regulation 2003, this publication may only be reproduced, stored or transmitted, in any form or by any means, with the prior permission in writing of the Publishers or in the case of reprographic reproduction in accordance with the terms of licences issued by the Copyright Licensing Agency in the UK. US copyright law is applicable to users in the USA.

Registered charity number: 207890

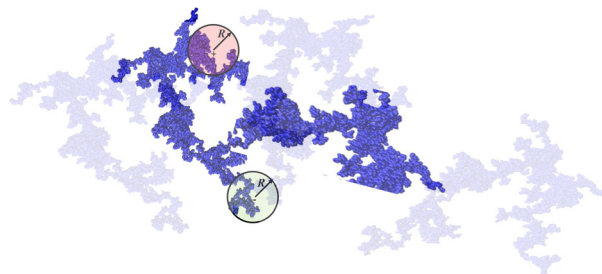


## COMMUNICATION

7907

## Scaling perspectives of underscreening in concentrated electrolyte solutions

Samuel A. Safran and Philip A. Pincus

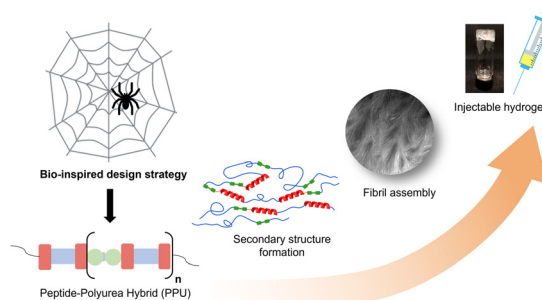


## PAPERS

7912

## Peptide–polyurea hybrids: a platform for tunable, thermally-stable, and injectable hydrogels

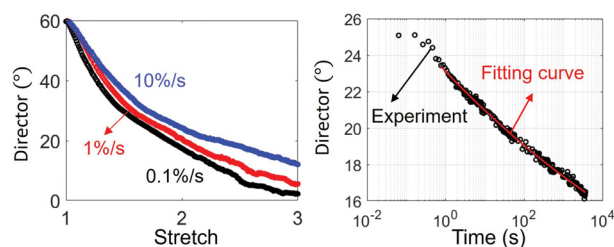
Jessica A. Thomas, Zachary R. Hinton and LaShanda T. J. Korley\*



7923

## Rate-dependent stress-order coupling in main-chain liquid crystal elastomers

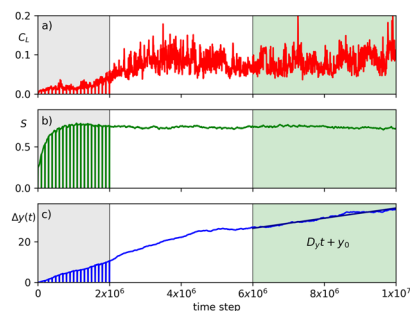
Chen Wei, Scott Cao, Yu Zhou, Dehao Lin and Lihua Jin\*



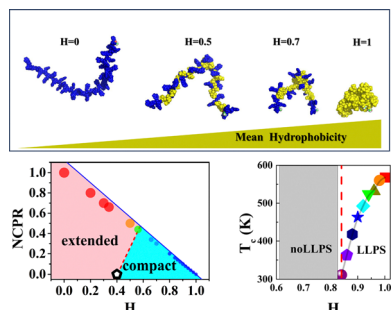
7937

## Dynamic phases and combing effects for elongated particles moving over quenched disorder

A. Libál,\* S. Stepanov, C. Reichhardt and C. J. O. Reichhardt\*



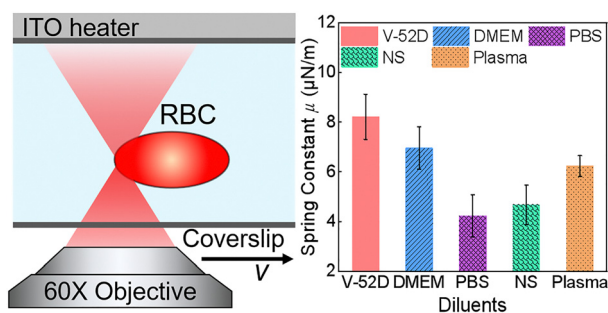
7944



### Multi-scale molecular simulation of random peptide phase separation and its extended-to-compact structure transition driven by hydrophobic interactions

Wen Bin Kang,\* Lei Bao, Kai Zhang, Jia Guo, Ben Chao Zhu, Qian-Yuan Tang, Wei Tong Ren and Gen Zhu\*

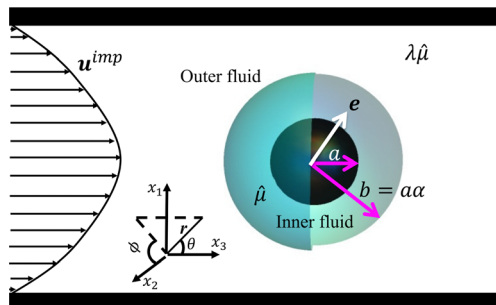
7955



### Deformability of mouse erythrocytes in different diluents measured using optical tweezers

Meng Shao, Rui Liu, Changxu Li, Yue Sun, Zhensheng Zhong, Fengya Lu, Jinhua Zhou\* and Min-Cheng Zhong\*

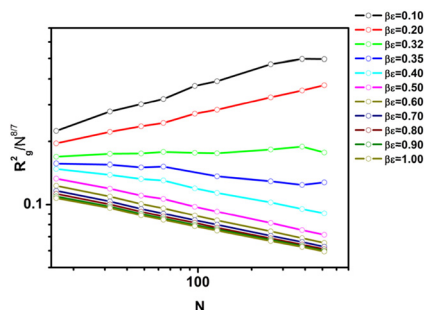
7963



### Active compound particles in a quadratic flow: hydrodynamics and morphology

Chaithanya K. V. S., Pavan Kumar Singeetham and Sumesh P. Thampi\*

7979



### Coil-globule transition in two-dimensional polymer chains in an explicit solvent

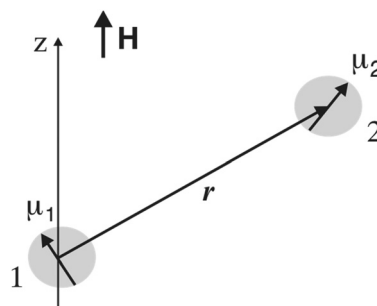
Piotr Polanowski and Andrzej Sikorski\*



7988

## Dynamic susceptibility of soft ferrogels. Effect of interparticle interaction

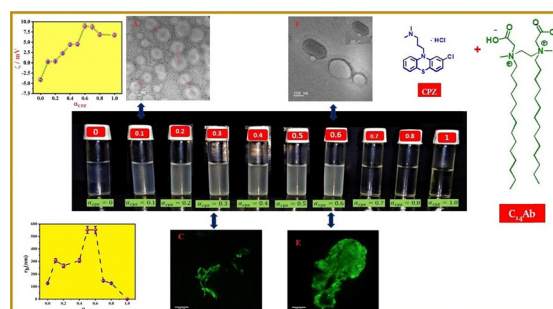
A. Yu. Zubarev



7995

## Comparative studies on the aggregate formation of synthesized zwitterionic gemini and monomeric surfactants in the presence of the amphiphilic antipsychotic drug chlorpromazine hydrochloride in aqueous solution: an experimental and theoretical approach

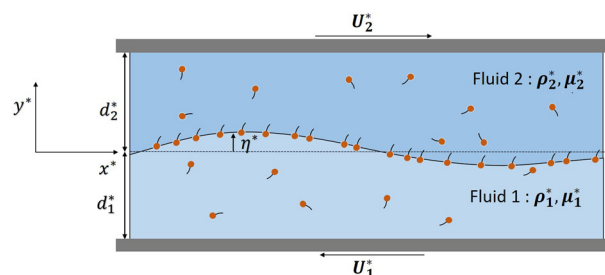
Rajesh Banik, Sourav Das, Asitanga Ghosh and Soumen Ghosh\*



8011

## Interplay of bulk soluble surfactants and interfacial kinetics governs the stability of two-layer channel flows

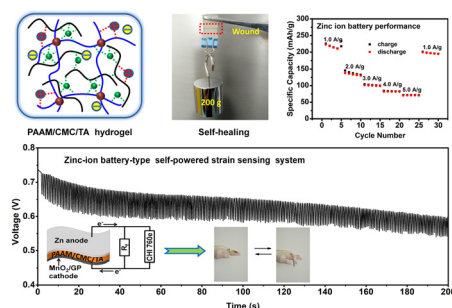
Gourab Chakraborty, Satyajit Pramanik\* and Uddipta Ghosh\*



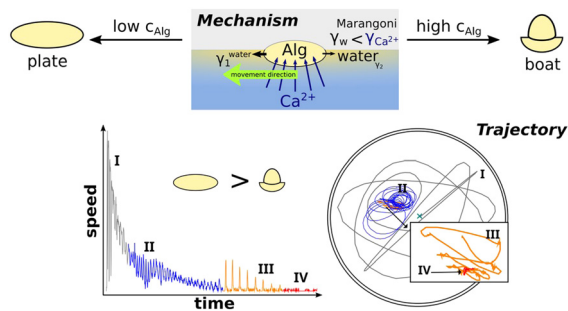
8022

## A zinc-ion battery-type self-powered strain sensing system by using a high-performance ionic hydrogel

Yueqin Li,\* Runtian Miao, Yong Yang, Lin Han and Qiangshan Han



8033



## Self-propulsion of a calcium alginate surfer

Réka Zahorán, Pawan Kumar, Dezső Horváth and Ágota Tóth\*

