
Team presentation



Research Team name: Technische Universität Darmstadt
Presenter name: PD Dr.-Ing. habil. Tatiana Gambaryan-Roisman

Team Presentation – Annual Workshop, COST Action MP1106
Dublin, September, 2012

Organizational structure

Faculty of Mechanical and Process Engineering



Center of
Smart Interfaces



Computational
Physical Chemistry



Nano- and
Microfluidics



Mathematical
Modeling and Analysis



Experimental
Interface Physics



Physics of
Surfaces



Electrochemistry
and Nanocatalysis

Center of Smart Interfaces (CSI): New Building



Inauguration of building: 11.09.2012



Prof. Cam Tropea,
Director of CSI

Prof. Peter Stephan,
Deputy Director of CSI



Team's general info



Research Team Name: Institute of Technical Thermodynamics



Institute of Technical Thermodynamics

Prof. Dr.-Ing. Peter Stephan



Groups

Methods

Numerical

Dr.-Ing. Frank Dammel

Analytical

PD Dr.-Ing.habil. Tatiana Gambaryan-Roisman

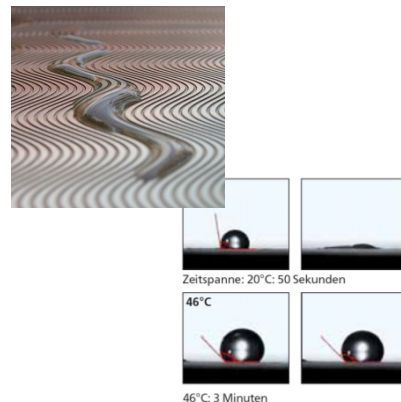
Experimental

Dipl.-Ing. Axel Sielaff

Films & Drops

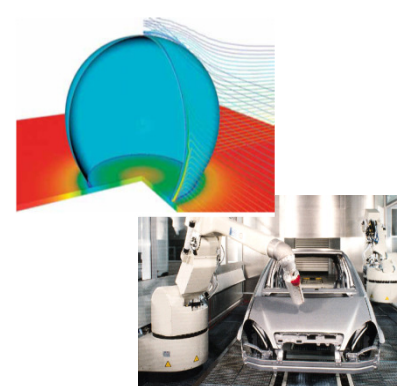
PD Dr.-Ing.habil.

Tatiana Gambaryan-Roisman



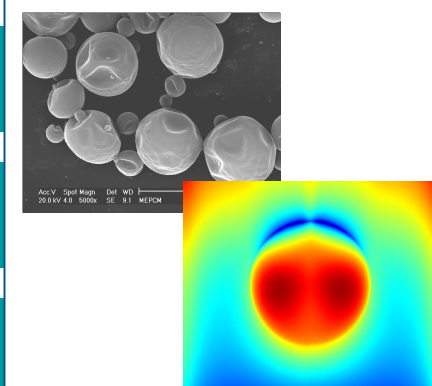
Evaporation & Drying

Prof. Dr.-Ing. Peter Stephan



Convection & Analysis of Thermal Systems

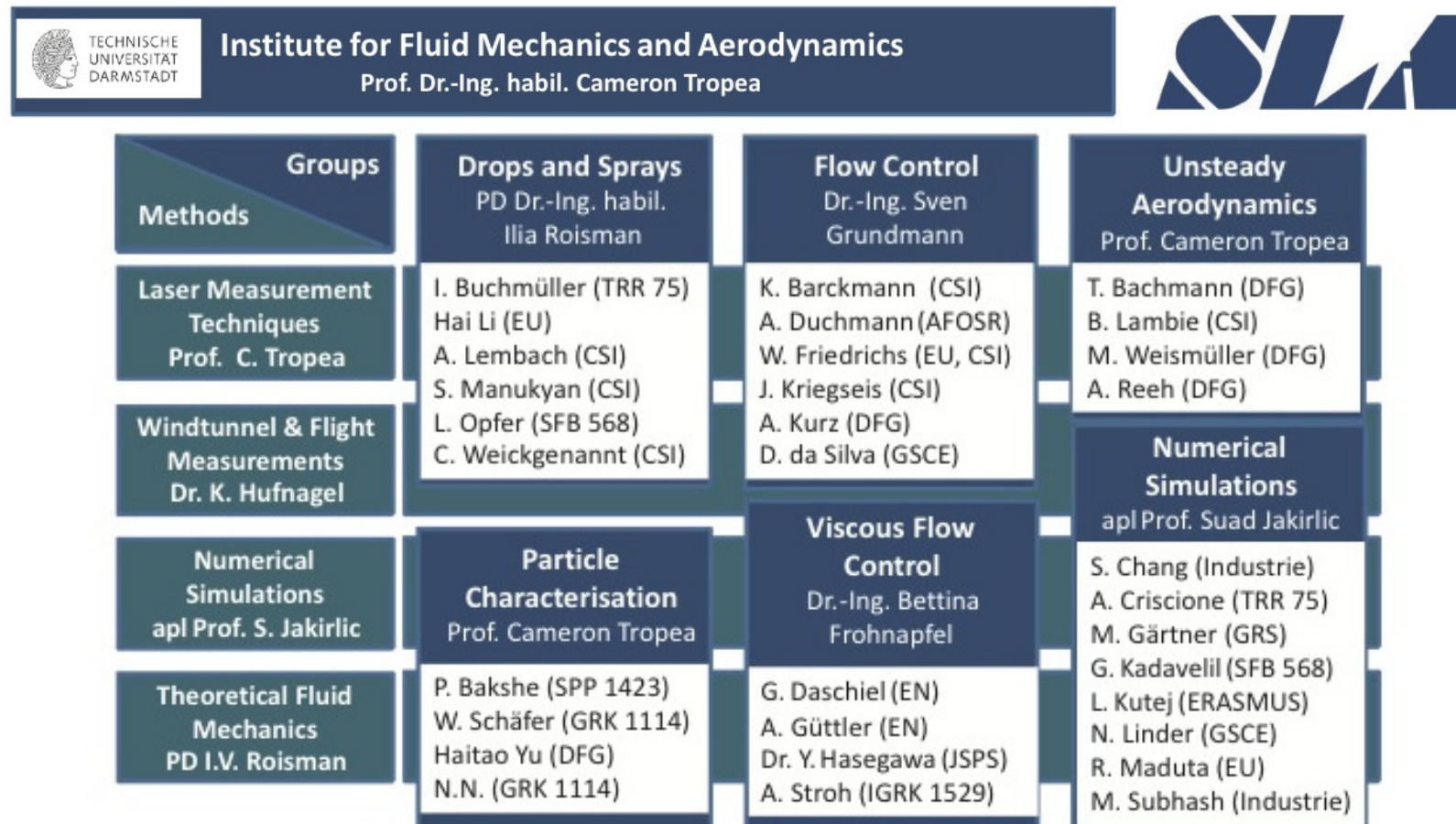
Dr.-Ing. Frank Dammel



2 group leaders, 20 PhD students, 5 technicians, 35 BSc/MSc students

Team's general info

Research Team Name: Institute of Fluid Mechanics and Aerodynamics



5 group leaders, 28 PhD students, 14 technicians

Team's general info

Research Team Name:

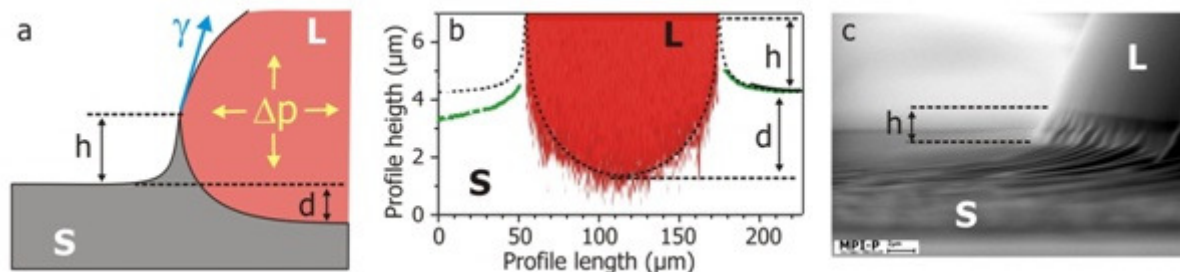


Number of team members: 8

Group leader: PD Dr.-Ing. habil. Elmar Bonaccorso

Research Interests/Expertise:

- Wetting, evaporation and condensation
- Surface forces
- Micro cantilever sensors
- Structure and dynamic of thin polymer films



<http://www.csi.tu-darmstadt.de/institute/eip/index.de.jsp>

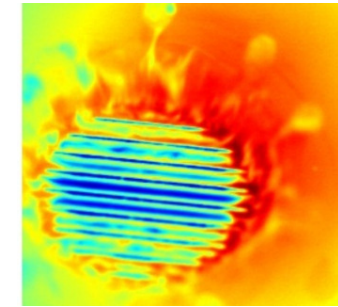
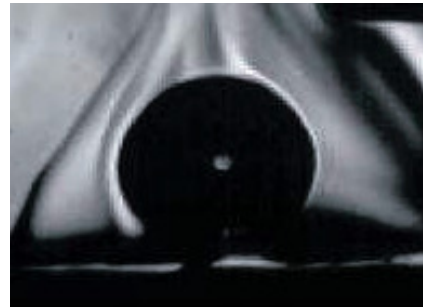
2 PostDocs, 5 PhD students

Relevance to MP1106

Research interests related to MP1106:

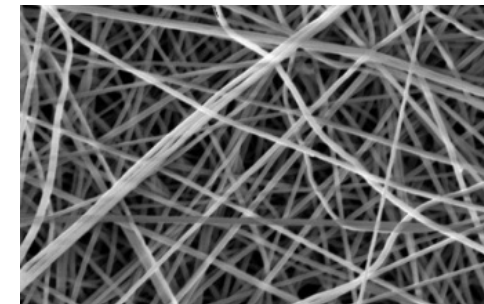
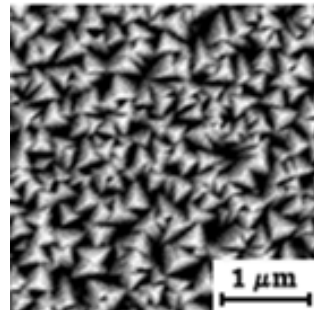
WG1:

- Static and dynamic wettability
- Drop/spray impact, spray cooling
- Drop evaporation/condensation
- Boiling
- Melting and solidification
- Surface tension-induced flows



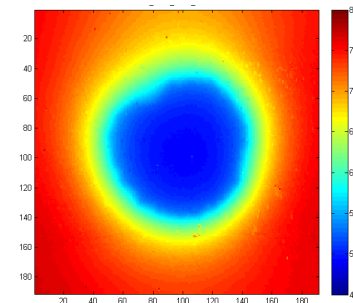
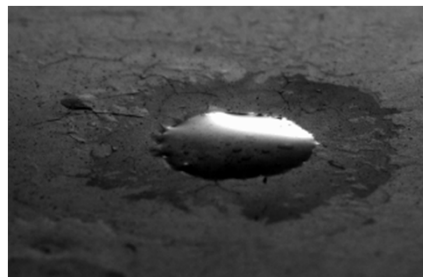
WG2:

- Modified substrates for controlling/intensification of transport processes
- Selective Laser Sintering



WG3:

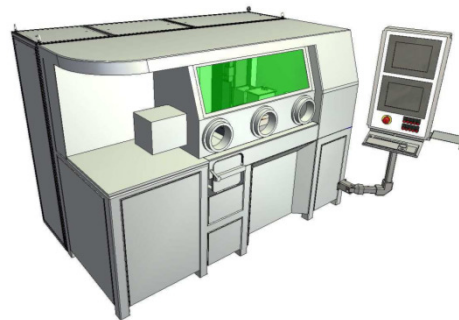
- Advanced measurement techniques for characterization of droplets, films, bubbles and interfaces



Lab description

Basic facilities, equipment, devices etc. :

- High-speed infrared cameras in middle-wave and long-wave range
- μ -PIV
- Chromatic confocal sensor for measurement of the liquid film thickness
- Phase-shift Schlieren system
- Multiwave ellipsometer
- Phase-Doppler technique
- High-speed video cameras (up to 1 Million fps)
- AFMs
- Nanoanalytic laboratory
- Microprototyping center



Project #1

Title of Collaborative Research Center: Droplet dynamics under extreme ambient conditions

Title of subproject C1: Numerical simulation of transport processes during drop impact onto heated walls under consideration of the evaporating contact line

Title of subproject C2: High resolution measurement of heat transfer during drop impact onto a hot wall under consideration of the evaporating contact line

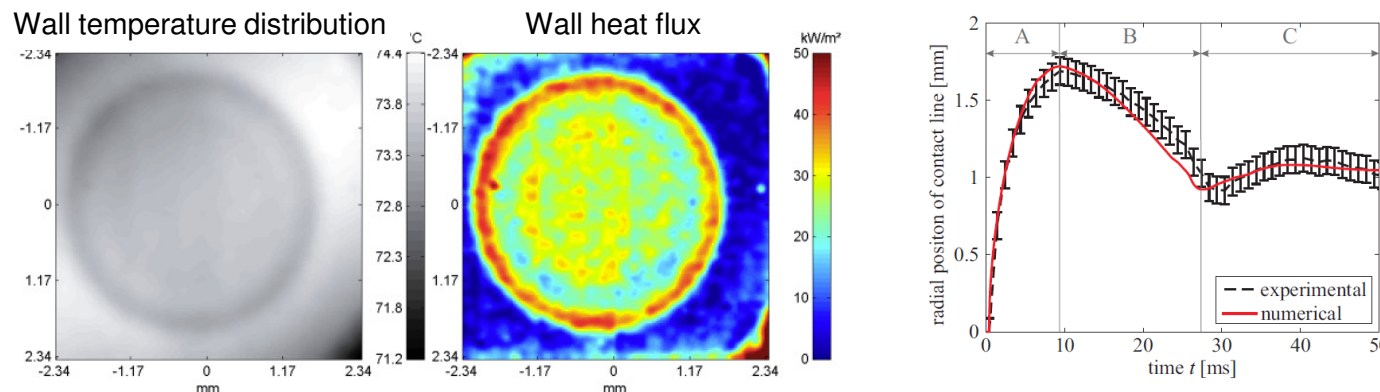
PIs: Prof. P. Stephan, Dr. Gambaryan-Roisman

Duration: 2010-2013 (continuation planned)

Funding organization: German Science Foundation (DFG)

People involved and their function: 2 PhD students

Most interesting results: Droplet impact and evaporation (experiment and simulations)



Herbert, S., Fischer, S., Gambaryan-Roisman, T., Stephan, P., Local heat transfer and phase change phenomena during single drop impingement on a hot surface, Keynote presentation at Eurotherm 2012, Poitiers, France.

Project #2

Title of Collaborative Research Center: Droplet dynamics under extreme ambient conditions

Title of subproject C3: Impact of supercooled droplets onto cold surfaces

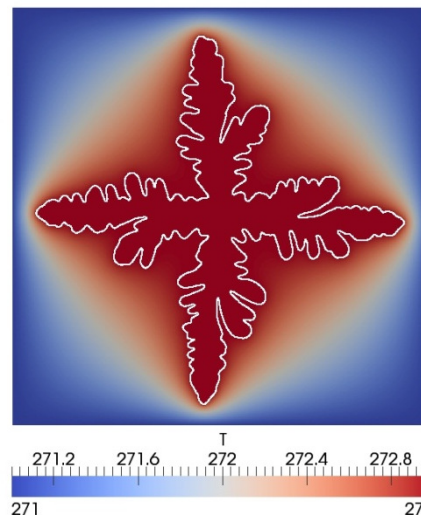
PIs: apl Prof. S. Jakirlić, Prof. C. Tropea

Duration: 2010-2013 (continuation planned)

Funding organization: German Science Foundation (DFG)

People involved and their function: 1 PhD student

Most interesting results: New computational code using the Level-Set method for simulations of various shapes of freely growing ice crystals at different supercoolings



Project #3

Title: Wetting of complex surfaces

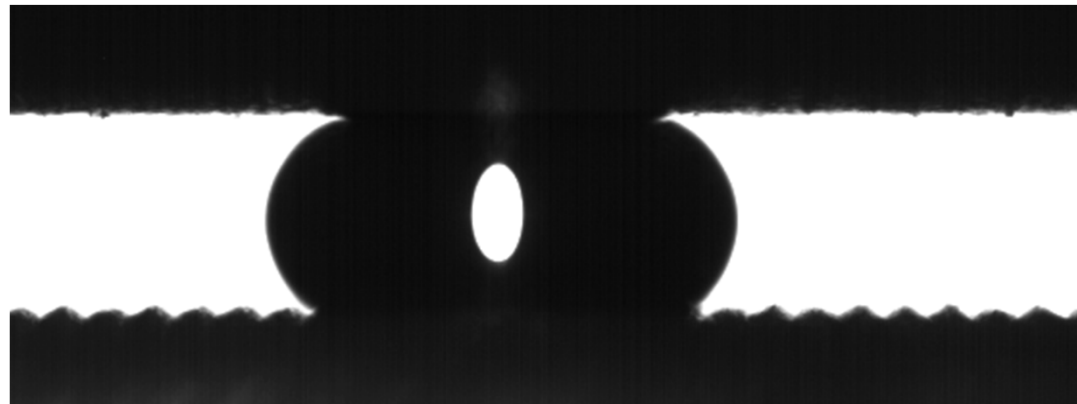
PIs: Dr. I. Roisman, Prof. C. Tropea

Duration: 2010-2013

Funding organization: Center of Smart Interfaces, TU Darmstadt

People involved and their function: 1 PhD student

Most interesting results: The advancing contact angle at low capillary numbers does not follow the Hoffman's law



Project #4

Title: Experimental and theoretical/numerical investigations of a single vapor bubble by boiling of mixtures taking into account the bubble coalescence

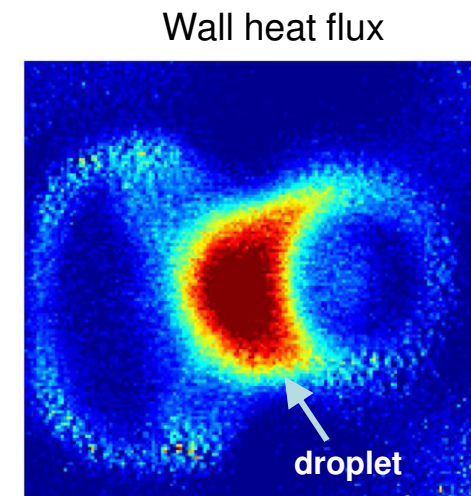
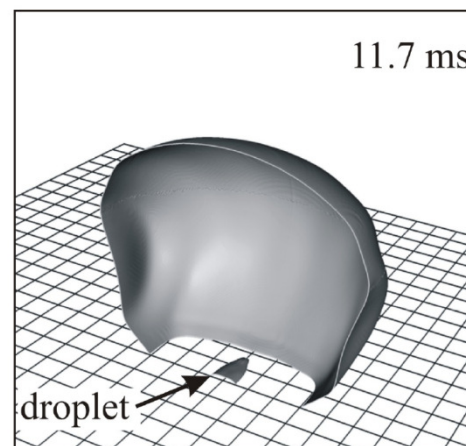
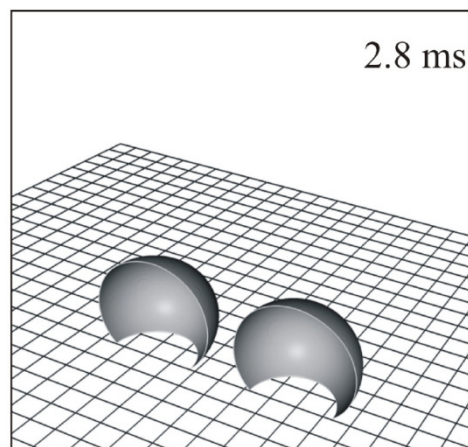
PI: Prof. Peter Stephan

Duration: 2005-2013

Funding organization: German Science Foundation (DFG)

People involved and their function: 2 PhD students

Most interesting results: Formation of sessile droplet after coalescence of two growing bubbles



Kunkelmann, Christian: *Numerical Modeling and Investigation of Boiling Phenomena*,
PhD Thesis, Technische Universität Darmstadt, 2011

Project #5



Title: Evaporation of droplets of mixtures, solutions and dispersions from rigid and deformable surfaces

PIs: Dr. E. Bonaccorso, Prof. H.-J. Butt, Dr. T. Gambaryan-Roisman, Prof. P. Stephan

Duration: 2011-2013 (continuation planned)

Funding organization: German Science Foundation (DFG)

People involved and their function: 2 PhD students

Facilities/equipment: confocal microscopy

Most interesting results: Effect of substrate elasticity on evaporation rate determined;
New method for measurement of temperature at the liquid-gas interface

