



LUDWIG-
MAXIMILIANS-
UNIVERSITÄT
MÜNCHEN

CAS^{LMU} CENTER FOR ADVANCED STUDIES



ASH-RELATED ISSUES IN GAS TURBINES

International Workshop at the Center for Advanced Studies of the
Ludwig-Maximilians-Universität Munich, Seestraße 13

Organized by Dr. Wenjia Song (CAS Young Center)

3 to 5 July 2017

MONDAY, 3 JULY 2017

13:00 – 13:15 **Welcome Address**

Session 1: Ash-related Issues in Gas Turbines

Chair: Prof. Dr. Uwe Schulz (German Aerospace Center)

- 13:15 – 14:15 **Dr. Rory Clarkson** (Rolls-Royce)
Latest Understanding of Turbine Engine Durability in Volcanic
Ash Clouds
- 14:15 – 15:15 **Prof. Carlos G. Levi** (UC Santa Barbara)
An Integrated Approach to the Degradation of High
Temperature Coatings by Silicate Deposits
- 15:15 – 15:45 Coffee Break
- 15:45 – 16:45 **Prof. Donald Bruce Dingwell** (LMU Munich)
Experimental Generation of Volcanic Ash
- 16:45 – 17:45 **Prof. Tom Fletcher** (Brigham Young University)
Particle Deposition Behavior of Ash from Various Fuels in
Gas Turbine Environments at Temperatures up to 1400°C
- 17:45 – 19:00 **Short Talks** (8 speakers, 5 mins/each)
Chair: Dr. Bettina Scheu (LMU Munich)
- 19:00 Reception

TUESDAY, 4 JULY 2017

Session 2: The Melting Behavior of Ash

Chair: Prof. Donald B. Dingwell (LMU Munich)

9:30 – 10:30 **Prof. Dr. Bernadett Weinzierl** (University of Vienna)
What Have We Learned from the Airborne Measurements in
the Eyjafjalla Volcanic Ash Layers in 2010?

10:30 – 11:30 **Dr. Wenjia Song** (LMU Munich)
Molten Silicate Ash Deposition in Gas Turbines

11:30 – 12:00 Coffee Break

12:00 – 13:00 **Captain Klaus Sievers** (Lufthansa/Vereinigung Cockpit)
Flying Around Volcanic Clouds: a Pilots' Account

13:00 – 14:00 Lunch Break

Session 3: The Impact of Ash Droplets

Chair: Dr. Wenjia Song (LMU Munich)

14:00 – 15:00 **Prof. Masahiro Fukumoto** (Toyohashi University of
Technology)
Splat Formation Issue in Thermal Spraying

15:00 – 16:00 **Prof. Dr. Uwe Schulz** (German Aerospace Center)
Damage of TBCs by Volcanic Ash and CMAS: Mechanisms and
Mitigation Strategies

16:00 – 16:30 Coffee Break

16:30 – 17:30 **Prof. Simon Goutier** (Université de Limoges)
Experimental Observation of High-Temperature Droplet
Impacts on Solid Surfaces

19:00 Workshop Dinner

WEDNESDAY, 5 JULY 2017

Session 4: Resistance of the Ash Deposition

Chair: Dr. Ulrich Küppers (LMU Munich)

- 9:30 – 10:30 **Youssef Assaf** (group of Prof. Anne-Marie Kietzig; McGill University)
Laser Micromachining of Biomimetic Surfaces
- 10:30 – 11:30 **Prof. Ichiro Naruse** (Nagoya University)
Control of Ash Deposition by Thermal Spraying Technique in Pulverized Coal Combustion Boilers
- 11:30 – 12:00 Coffee Break
- 12:00 – 13:00 **Prof. Hongbo Guo** (Beihang University)
Protect Thermal Barrier Coatings from CMAS Infiltration
- 13:00 – 14:00 Closing of the Workshop and Lunch
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Short Talk List

- 17:45 – 17:55 **Ms. Siddharth Lokachari** (Xiamen University)
Influence of CMAS on the Youngs Modulus of TBC
- 17:55 – 18:05 **Dr. Peter Mechnich** (German Aerospace Center)
Volcanic Ash Resistance of APS Y_2O_3
- 18:05 – 18:15 **Dr. Steven Whitaker** (Ohio State University)
Deposition in Internal Turbine Cooling Passages
- 18:15 – 18:25 **Dr. Ravisankar Naraparaju** (German Aerospace Center)
Simulates Realistic Volcanic Ash Deposition in Jet Engines
- 18:25 – 18:35 **Ms. Shanjie Yang** (Beihang University)
Micro-Structure Control of YSZ-TBCs with PS-PVD
- 18:35 – 18:45 **Dr. Ulrich Küppers** (LMU Munich)
Why is Volcanic Ash not just any Solid Matter Dispersed in Air?
- 18:45 – 18:55 **Dr. Dirk Müller** (LMU Munich)
Characteristics of Volcanic Ash in Dependence of Grain Size
- 18:55 – 19:05 **Dr. Kai-Uwe Hess** (LMU Munich)
Predicting the Shear Viscosity of CMAS Melts