Symposium E2-I:

Lightweight Materials and Structural Solutions for Transport Applications

	Organiser	Institution	Contact
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Comments on candidate and symposium structure

Symposium Organisers:

Kambiz Kayvantash is managing and scientific director of the company Société CADLM. From 2008 to 2011, he held a professorship for Automotive Technology at Cranfield University (UK). Kambiz Kayvantash is or has been involved in several transportation related European projects, like the Integrated Project APROSYS, in which he was responsible for the subproject on virtual testing. He has been involved in EUROMAT as symposium organizer since EUROMAT 2009 and organizes the SimBio-M conference series on simulation in biomechanics. Besides, he acts as vice president for Europe of the International Society of Multiphysics.

Axel von Hehl studied “Mechanical Engineering” at the Technical University of Dortmund and “Metallurgy and Materials Science” at RWTH Aachen University. As head of the R&D department at ThyssenKrupp Rothe Erde GmbH, he received his PhD for work on thermo-mechanical treatment in multi-pass forming operations and its numerical simulation. Since 2007 he leads the department of lightweight materials at the Foundation Institut für Werkstofftechnik (IWT) in Bremen, which focuses on lightweight metallic materials and hybrid structures from component manufacture to joining techniques and test methods.

Symposium:

The focus of the symposium is on structural, i. e. mechanical load bearing materials and material combinations used in transport applications with the aim to increase safety and reduce weight. In this wider context, specific attention is dedicated to automotive and aerospace applications. As the field as such is very wide, three individual sessions have been defined which concentrate either on a specific approach towards the general aim, or on a narrowed-down field of application.

To create a link first between these sessions, and secondly between the application of advanced materials and structures and the fundamental materials science facets of their development, aspects of modeling, simulation and optimization of materials and structures in transportation has been added as an umbrella session. The symposium as a whole is thus structured as follows:

Session 1: Modeling, simulation, optimization of materials and structures in transportation

Modeling and simulation based techniques have a multiple impact on material usage in transportation structures. Existence of suitable material models is a prerequisite for introducing new materials in product design. Such models and the associated simulation and optimization techniques and tools are increasingly required to include stochastic methods in order to allow e.g. robust optimization and enable virtual testing approaches. At the same time, fundamental simulation

techniques like e. g. ab initio methods are more and more being used to tailor material properties to specific application requirements on several length scales.

Session 2: Production, Properties and Applications of Hybrid Materials and Structures

Development of lightweight structures for transportation-related applications focuses more and more on hybrid structures, with the aim to place the right material at the right position within the structure. Although both aerospace and automotive industries use more and more fibre-reinforced plastics (FRP), there is still a high share of metals in use. Therefore the properties of the materials combination as well as economical production processes are the main interest of today's development. The symposium concentrates on the production and properties of metallic-metallic (e. g. Al-Steel, Al-Ti) as well as non-metallic- metallic materials and structures (e. g. Al-FRP, Steel-FRP) and addresses contributors from universities and industry dealing with joining technologies and their resulting properties in view of mechanical performance as well as in view of their corrosion for hybrid structures.

Session 3: Intelligent and Adaptive Materials and Structures

Intelligence of materials and structures implies an inherent ability to respond to stimuli in a coordinated manner, including variations in reaction that could depend e. g. on situational context. Realization of such materials will progress from sensor-equipped structures to Sensorial Materials via material integration of full sensor networks. Expected benefits of the resulting intelligent materials are

- increased safety via direct response to or up-to-date knowledge on e.g. structural state,
- reduced weight of safety-critical structures based on availability of such features and
- limited costs by facilitating concepts like need-based and predictive maintenance.

In terms of concrete applications, e. g. Structural Health Monitoring and Control as well as maintenance/recycling/reuse-supporting measures will be addressed.

Session 4: Energy absorbing and Protective Materials and Structures

Light weighting transportation systems affords new structural solutions. Design criteria for these often include passive safety related performance characteristics. These have to be experimentally derived and translated into general principles on material and structural level, including e.g. the role of material interfaces. Besides, there is a continuing tendency towards improving the overall safety of transportation units e.g. by coverage of more accident scenarios with dedicated safety systems (e.g. vulnerable road user protection) or integration of active and passive systems. The present symposium addresses the related issues from the perspective of mechanics of materials and structures with a special focus on high strain rate/impact performance.

An agreement has been reached with the Editorial Board of **Materials & Design** (Elsevier, Thomson Reuter JCR Impact Factor 2011: 2.20) to publish selected contributions from the symposium in a Special Issue of this journal after the conference.