G3.I: Materials in Functional and Structural Components
Wednesday 11 September 2013
Room: Sevilla 3
Chair: Ehrenfried Zschech, Fraunhofer IZfP, Dresden, Germany

Herbert von Bose
Director, “Industrial Technologies”, DG Research & Innovation, European Commission

Mr von Bose completed his studies in law from the Universities of Bonn, Geneva and Heidelberg in 1975. He was an assistant at the law faculty of the University of Montpellier before joining the German Ministry of Justice in 1976. From 1979 to 1983, he practices as a lawyer in Manheim and Heidelberg. In 1983, he started working for the European Commission in Brussels. In 1996, Mr von Bose became the Head of Unit for Aeronautics, Space, Rail and Maritime. From 2004 to 2007, he was the Head of Unit for “Security Research and Development”. In September 2007, he became Director for "Industrial Technologies" in DG Research & Innovation.

13:30 – 14:00

Title: Horizon 2020: Materials, a key driver for innovation

Some 70% of all technical innovations hinge directly or indirectly on the properties of the materials they use. Materials have been identified as one of the Key Enabling Technologies (KETs), and will certainly have a place and role in the upcoming framework programme for funding research and innovation, Horizon 2020. A significant part of future goods and services is as yet unknown, but the main driving force behind their development will be the KETs: mastering these technologies means being at the forefront of managing the shift to a low carbon, knowledge-based, competitive and sustainable economy. In addition, there are also important challenges to overcome in securing access to raw materials, also through improving the recycling and recovery of materials from waste.

An European Space Agency Perspective on Advanced Materials, Coatings and Manufacturing Processes

Tommaso Ghidini
Head of the Materials Technology Section
European Space Agency - ESA/ESTEC, Noordwijk, The Netherlands

Tommaso Ghidini obtained his M. Sc. in Engineering Mechanics from the University of Parma.
After a Ph. D. in Fracture Mechanics (with particular focus on advanced joining technologies) at the Institute of Materials Research of the German Aerospace Centre, the DLR, Dr. Ghidini joined AIRBUS in the Fatigue and Damage Tolerance Department working on the A380 as well as A400M civil and military aircraft Programme.
He joined the European Space Agency (ESA) in 2007 as Fracture Mechanics and Stress-Corrosion expert and then became the VEGA Launcher Product Assurance Engineer: VEGA is the most recent Launcher in the ESA family which was successfully launched in February 2012 and which performed his second successful launch in May 2013.
Since January 2012 Dr. Tommaso Ghidini is the Head of the Materials Technology Section at the European Space Agency. The Materials Technology Section is in charge of all Metallic Materials and related Manufacturing and Surface Treatment Processes for all ESA spacecraft and launchers Programme.

14:00 – 14:20

The majority of the materials used in spacecraft structure and mechanical devices, propulsion systems and launchers manufacture are normally selected from known and well proven aircraft applications. However, the advancement in space technology has been made possible by many specific breakthroughs in materials, coating systems and manufacturing processes, facilitating the development of highly sophisticated spacecraft, launch vehicles and components. In the present paper a detail review of current research and development programme performed at the European Space Agency (ESA) in the field of metallic as well as non-metallic materials, coating systems and manufacturing technologies is presented. It covers applications ranging from large launchers primary structures and solid/liquid propulsions systems, satellites propulsion units, solar cells, as well as materials for electronic applications, including examples from inner planetary missions with extreme environmental conditions (temperature and radiation).
PTFE as well as Metal Matrix Composites, thermoplastics, aerogels, crushable materials, advanced structural ceramics and glasses as well as SiC reinforced Titanium alloys are presented. Moreover an overview on black/white coatings for heat shielding applications used on near-Sun missions, on aqueous coating systems reducing the volatile organic compound and the hazardous potential as well as on biodegradable materials is also given.
Advanced manufacturing processes, such as Additive Layer Manufacturing (ALM), Friction Stir Welding (FSW), composites bonding/joining techniques as well as innovative composites manufacturing processes are described. Particularly, the use of game changing technologies such as ALM, is extensively exploited on conventional and non-conventional metals, polymers, ceramics and geopolymers (lunar regolith), ranging from few grams up to few tons of material.
Finally, restrictions imposed by environmental regulations in Europe have significant implications for space programmes, the most immediate one being the possible disruption of qualified materials and processes. In order to satisfy stringent

corrosion protection coatings as well as lead free electronic assemblies materials.

Tim Warner

Director of Aerospace R&D at Constellium's research center, Paris, France
Constellium CRV, 725, Rue A. Berges , CS 10027, 38341 Voreppe, France
Timothy.warner@constellium.com

Dr. Warner is currently R&D group manager for aerospace and metallurgy at Constellium CRV, France. He has worked for 23 years in the aluminum industry, mostly in R&D. After an initial focus on corrosion resistance, Dr Warner worked on the development of new alloys for the aerospace industry before spending a couple of years at Constellium's Ravenswood (West Virginia) plant as development manager. For the past 7 years he has been in charge of Constellium's R&D program on aerospace and technical products, based in Voreppe (France).
Prior to working for Constellium, Dr Warner obtained a PhD from the University of Cambridge (UK) in the field of metal matrix composites. He is a named inventor of over 20 patents, mostly in the field of aluminum alloys for aerospace, and co-author of more than 30 papers in scientific journals or international conferences.

14:20 – 14:40

Title: Recent advances in aluminium product development for transportation

The increasing costs of energy usage and concern for the environmental impact of transportation generate a need for reducing vehicle weight. In general, higher performance materials can contribute to this need, but their application needs to be economically viable. The acceptable additional cost of a vehicle per kilo weight reduction depends on the application, ranging from of order 1 €/kg saved in automotive applications in the absence of regulatory or project scheduling pressure to over 1000 €/kg in some aerospace contexts. The cost increment for the OEM clearly includes material price but also the cost increase or reduction involved in manufacturing a part from the material. Materials development efforts must thus include both performance increases and overall material and part manufacturing process cost optimizations.
Aluminium, as a light metal used in many mass market applications, has both an excellent track record and significant future potential for meeting this challenge. In this overview, examples of recent materials developments for automotive and aerospace applications will be presented. The emphasis will be on the developments and opportunities inherent in moving into alloy systems that have not traditionally been used in large quantities for these applications. For automotive applications, this involves exploring alloys outside the low-Cu 6xxx alloys that are the mainstay of today's body-in-white applications, whilst for aerospace applications the ongoing activity is mainly in exploiting the potential of the Al-Cu-Li system. In all cases, the materials development efforts will be presented in the context of both the engineering requirements for weight reduction and the constraints and opportunities in their downstream processing.