Editorial

Institution of MECHANICAL ENGINEERS

Journal of MECHANICAL ENGINEERING SCIENCE

Proc IMechE Part C:
J Mechanical Engineering Science
2019, Vol. 233(3) 751–752

DOI: 10.1177/0954406219827177
journals.sagepub.com/home/pic
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Special issue on the 3rd Indo Austrian Symposium on Advances in Materials Science

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The Indo Austrian Symposium on Advances in Materials Science has now become a regular event. It was only in 2010 when we, with the help of Dr. K. Balasubramanian, the director of the NFTDC (the Non Ferrous Materials Technology Development Centre in Hyderabad, India), organised the first meeting in Hyderabad. The second meeting was held in Wiener Neustadt, Austria, in 2014. It is heartening to see that the third one was staged at the Indian Institute of Technology in Mumbai in December 2016.

The main topic of the symposium was advances in materials science. This symposium was divided into five main areas, namely materials characterisation, degradation and protection of materials, materials for structural applications, materials for electrochemical energy storage and materials for healthcare. It is extremely interesting to note that significant responses were received in each area from India and Austria.

Over the years, awareness of this meeting is increasing. Available funds are also improved. The number of participants from the host and the visiting country shows an upward trend. It is even more encouraging to see more and more institutions participating and the meeting taking a meaningful shape. We envisage many collaborative research approaches and exchange of scientists or academicians taking place as a natural outcome of this meeting.

We are delighted to note that the symposium was attended by 158 registered delegates, of which 21 were from Austria and 137 were from India – not only from India but also from several countries across the world. There were 70 presentations, of which six were plenary lectures, 12 were keynote lectures and 17 were invited talks. For the special issue, we have received a total of 10 manuscripts, of which five were rejected. Fifty per cent of the manuscripts were accepted for publication in *IMechE Part C: Journal of Mechanical Engineering Science*.

The first manuscript entitled "Combustion synthesis and electrochemical evaluation of Cr-substituted Lithium Vanadium (III) Phosphate" by a group of Austrian researchers[1] is concerned with the effect of Cr^{3+} partial substitution on vanadium site in monoclinic lithium vanadium (III) phosphate (LVP) structure resulting in compounds with the general formula: $Li_3V_{2-x}Cr_x(PO_4)^{3-}C$ (x = 0, 0.05, 0.1, 0.15). A two-step sol–gel combustion method was employed in the syntheses. The electrochemical performance of the active materials was examined. The unsubstituted compound LVPC delivers higher capacity compared to the Cr-containing samples due to chromium inactivity in the potential range 3.0–4.4 V vs. Li/Li^+. However, the Cr-substituted materials show better overall capacity retention (97–97.6%) in contrast to $Li_3V_2(PO_4)^{3-}C$ (96%) in long cycling.

The paper entitled "A multi-level damage and creep behaviour of material subjected to high pressure: metal vs. composite – a micromechanics approach" by an Indian research group[2] reports on multi-level damage and creep behaviour of metal and composite material under external high pressure using the finite element concept. A fatigue damage model with microcracks and improper interface is portrayed. An overall elastic properties and damage evaluation is presented. Thermo-elastic creep response of materials based on Norton's law is also given. The proposed nonlinear constitutive model is in conformity with the overall elastic damage behaviour of a composite material. Significant new insights of micromechanical damage, creep and collapse behaviour of composite material are found. Review of recent techniques is also included and rationalised with insights for upcoming development.

The third paper entitled "A novel electrochemical comparative sensing interface of MgO nanoparticles synthesized by different methods" by another Indian research group[3] provides important recent developments in nanotechnology, for the biosynthesis of metal nanoparticles using enormous techniques, and shows multidimensional advancements. This method for acquiring green nanotechnology leads to a new

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dimension of nanobiotechnology. The emphasis is laid on the synthesis of MgO nanoparticles using green technology. The average size of MgO nanoparticles synthesized by various sources is in the range of 85–95 nm. The extracts of plants are capable of producing MgO nanoparticles efficiently. Cyclic voltammetry and electrochemical impedance spectroscopy reveal good results. The electrode modified with MgO nanoparticles obtained from plant extract employing a cost effective and environment-friendly method exhibits good stability and high conductivity.

The fourth paper, ''Deformation behaviour of low carbon high Mn twinning-induced plasticity steel'' by a group of Indian researchers,[4] presents microstructural characterisation with optical microscopy as well as scanning and transmission electron microscopy combined with selected area deflection pattern investigations. The steel is prepared by melting, casting, hot forging, hot rolling, solution treatment and cold rolling. Twinning-induced plasticity steel shows fully austenite microstructure with annealing twins after hot rolling and solution treatment. After 10% cold deformation, deformation twins are initiated. They are finer than the annealing twins and are blocked by grain boundaries. After the application of 30% cold rolling, twin and austenite grains get fragmented. At 50% cold deformation, twinning is evident as the main deformation mechanism. Deformation behaviour of this steel is mainly influenced by the stacking fault energy: when between 18 and 45 mJ/m^2, twinning is the dominating deformation mechanism.

Finally, the fifth paper, ''An investigation on shear banding and crystallographic texture of Ag–Cu alloys deformed by high-pressure torsion'' by a group of researchers from Austria and Germany,[5] reports the role of initial microstructure on the generation of shear bands during severe plastic deformation of two dual-phase alloys, a cast eutectic silver–copper alloy and an equivolume silver–copper powder mixture. Structural refinement via reduction of the microstructure and atomic mixing are important in nanocrystalline alloys, yielding important functional properties. However, such refinement may be combined with localized deformation in shear bands, which are detrimental for practical forming processes. While the heterogeneous structure in the powder mixture alloy favoured shear band formation, instabilities were delayed till much higher strains in the cast eutectic alloy.

It is of course our pride and privilege to associate us with this symposium. We must thank Prof. V. S. Raja and Prof. N. Prabhu for encouraging and supporting the proposal to organise the meet in IIT, Mumbai. Needless to mention Dr. Amartya Mukherjee, whose untiring effort has taken us to this level. Support from Prof. Johannes Bernardi in agreeing to become co-chairperson and in getting a number of Austrian speakers is also greatly acknowledged. We take this opportunity to extend our sincere gratitude to all our sponsors who have readily agreed and supported us generously. Our sincere thanks to all plenary, keynote and invited speakers for accepting our humble invitation and to speakers of contributed talks and poster presenters for their spontaneous response. Last but not least, we extend our hearty gratitude to all those who have supported us indirectly.

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