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[PL5] Plenary Talk 5

Property optimisation of titanium alloys based on phase stability evaluation and microstructure design

Chair: Dongsheng Xu(IMR-CAS, China)

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Rui Yang

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Property optimisation of titanium alloys based on phase stability evaluation and microstructure design

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Titanium alloys are extensively used in aircraft engines and have emerged as ideal materials for a wide range of biomedical implants. Applications of titanium alloys in such reliability sensitive components/devices require a thorough understanding and precise control of properties which are determined by the rich variety of phase transformations and multi scale microstructures. In many cases experimental investigations have already pointed to one or several key processes or parameters that dominate the properties and service performance of the alloys. Under such circumstances the computational and modelling tasks are relatively well defined and the results can be critical in clarifying and solving the problems. This talk will review work conducted in the past few years using such an experiment plus computation approach, taking examples from near-alpha titanium alloys and titanium aluminides for aero engine applications and from beta-type titanium alloys for biomedical use. The topics to be covered include alloying effects on the alpha phase and their relations to creep resistance and cold dwell fatigue propensity, alloying effects, phase stability and deformation mechanisms of high strength titanium aluminides, and metastable phases and stress induced transformations in beta-type titanium alloys.