Nanostructured materials | Jožef Stefan Institute Ljubljana, Slovenia

SEMINAR

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Dopant effects on grain boundary plane distributions in alumina

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Over the last decades, the emergence and establishment of advanced rapid sintering methods has significantly enhanced the exploration of the two-dimensional density-grain size parametric space. Favoring densification over grain growth, these sintering techniques enabled rapid progress in fields such as non-cubic transparent ceramics, where birefringence renders optical properties highly sensitive to grain size. The same rapid sintering methods offer opportunities in ceramic microstructure engineering beyond the density-grain size paradigm: the ability to achieve full densification in minutes – or even seconds – allows development of heat treatments specifically tailored to advanced microstructural design, and in particular grain boundary engineering.

In this study, abnormal grain growth is employed as a proxy indicator for the occurrence of complexion transitions in grain boundaries. Changes in grain boundary plane distributions before, during, and after abnormal grain growth are studied to elucidate how various doping strategies and associated complexion transitions influence the statistical occurrence of specific grain boundary planes. Given the significance of grain boundaries in critical macroscopic properties, the work aims to demonstrate how rapid sintering techniques can be effectively harnessed for advanced materials property engineering and ceramic performance optimization.

Kindly invited.