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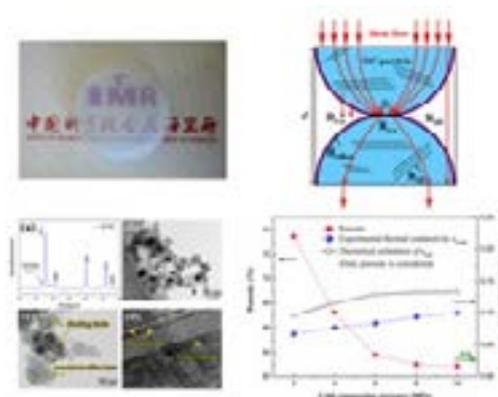
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Strategic modification of nanostability for super thermal insulating materials

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The critical challenge of current nanoscale oxide super thermal insulation materials, such as SiO₂ and Al₂O₃ nano-particle aggregates and their composites, is the critical trade-off between extremely low thermal conductivity and unsatisfied thermal stability (nanostability typically below 1100°C). It is crucially important to modify current materials and further discover novel candidates which could balance the two key properties. This presentation shows progresses on optimal thermal stability of modified Al₂O₃ nano-particle aggregate; and in addition, new candidates of super thermal insulation materials, such as nano-Si₃N₄ and nano-SiC, which are commonly believed as excellent heat conductors. Especially, the new nano-systems exhibited good nanostability up to 1500°C. The striking results incorporated superior sintering stability of structural ceramics as SiC and Si₃N₄ with multiple phonon scattering mechanisms in nano-materials. It is possible to put forward this novel concept to design and search new types of high temperature thermal insulation materials through nano-scale morphology engineering of structural ceramics with excellent thermal stability, regardless their high intrinsic lattice thermal conductivities.



Biography

Jingyang Wang is the Distinguished Professor and Division Head in the High-performance Ceramics Division at the Shenyang National Laboratory for Materials Science, China. He has been internationally recognized for his sustained contributions to innovative technology in processing bulk, low-dimensional and porous ceramics, and to fundamental understanding of multi-scale structure-property relationship of advanced structural ceramics. His works have extensively covered fundamental and technological developments of carbides, nitrides, oxynitrides, silicates, and hafnates for extreme environmental applications. He has published 185 peer-reviewed SCI papers (WoS H-index factor 38), holds 18 registered patents, and has delivered more than 50 keynote/invited lectures. He was the recipient of Acta Materialia Silver Medal (2016) and National Leading Talent of Young and Middle-aged Scientists (China, 2015), and served as the Chair-elect (2016) of Engineering Ceramic Division of The American Ceramic Society (ACerS) and the Program Chair of 41st ICACC hosted by ACerS in Florida.

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