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Nanoscale Ordered Structure in High Temperature Ceramics AZAR ALIZADEH, JULIN WAN, PATRICK MALENFANT, SETH TAYLOR, SERGIO LOUREIRO, MOHAN MANOHARAN, GE GLOBAL RESEARCH, NANOTECHNOLOGY PROGRAM TEAM — Many natural ceramic structures, such as nacre, exhibit fracture toughness values much higher than those of the constituent ceramic material. There are many factors contributing to this enhancement, with the ordered microstructure playing a critical role. A key challenge in making bio-inspired, structural ceramics based on these observations is to create and preserve nanoscale order in high temperature ceramic materials. Towards this goal, a bottomup approach was explored to build nanometer scale structures with long-range order in a Si-C-N system. Polymeric precursors that lead to the desired ceramic composition were self-assembled using block copolymers as structure-directing agents. It will be shown that the ordered nanoscale structure created in the block copolymer/precursor hybrids can be preserved through the pyrolyzation process, thereby leading to ordered nano-structures in the final dense ceramic. The structural and compositional evolution of this process was characterized by SAXS and TEM.

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