Ceramic Patterning and Microstructuring from Inorganic Polymers with Lithographic Techniques

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Organic polymers have been widely used for devices including 2D patterns and diverse 3D microstructures. However, they are not adequate in harsh environment due to lack of resistances. And ceramic structures on the micro- or nano-scales have been demanded. Here, we report the fabrication of various SiC based ceramic 2D patterns and 3D stereostructures using photosensitive inorganic polymer and diblock copolymers via various photo-induced curing processes and self-assembling, followed by pyrolysis to form a ceramic phase. At first we report the fabrication of nano- and micro-structuring ceramic features using a negative type of inorganic photoresist via photolithography, or UV-assisted nanomolding or nano-stereolithography with two photon absorption dyer, methacrylated polyvinylsilazane. Secondly, inorganic-organic diblock copolymer synthesized by combining vinylsilazane block with polystyrene block occurred the phase-separation at the nanoscale to form ordered mesoporous SiCN ceramic after pyrolysis. Finally, in UV-NIL process the adhesion force of PFPE (perfluoropolyether dimethacrylate) mold was examined to various photo curable resins in comparison to silicon, quartz and soft PDMS molds.