

Fabrication of zinc oxide inverse opals using a supercritical carbon dioxide

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This paper demonstrates a sol-gel reaction in supercritical carbon dioxide(scCO₂) for fabricating zinc oxide inverse opals. For inverse opals that can be regarded as the negative replica of opals, we have a collection of micrometric spherical cavities surrounded by a high refractive index material, in which both the cavities and the high refractive material is connected throughout the structure. Specially, three-dimensional zinc oxide structures have attracted particular interest due to their unique optical and physicochemical properties.

3D polystyrene(PS) latex arrays have been used as templates. The polymeric templates were reacted with zinc acetate dihydrate used as precursors of zinc oxide and water in scCO₂ at certain conditions. After calcinations of the PS template, the inverse opal materials obtained. By using a scCO₂, shrinkage of the network upon condensation was small. The synthesis of inverse opals in scCO₂ overcomes some of the limitations of the liquid-phase techniques, being a faster method of synthesis and, at the same time, rendering materials of unique properties.