

Fabrication of Inverse Opals with Rutile Phase of Titania

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Inverse opal structure of rutile phase titania has been largely highlighted as ideal and perfect structure in photonic crystal research field since rutile has good physical properties such as thermal stability, high refractive index and low absorption in the visible region. Especially its high refractive index (> 2.8) can bring a full band gap in the visible light range. Titania inverse opals fabricated by solution infiltration need further heat treatment at high temperature to induce phase transformation from amorphous to rutile, their macroporous structures could not be maintained.

In here we fabricate nano-sized titania as rutile phase using titanium tetrachloride as precursors under acidic condition. Nanoparticles are infiltrated into colloidal crystals formed with monodispersed polystyrene spheres using capillary force. After removing PS, refractive indexes of inverse opal are measured by ellipsometry. These inverse opals are definitely a promising photonic crystal for controlling the light compared to the other photonic crystals made with low refractive index materials.