

## Bulk Synthesis of Macroporous Particles by Colloidal Templating

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We have prepared composite colloidal crystals of polystyrene beads with inorganic materials ( $\text{TiO}_2$  or  $\text{SiO}_2$ ) inside oil-in-formamide emulsions and then burned out polymer beads by heat treatment around 500 °C leaving macroporous particles. Since pore size is comparable to light wavelength, they can scatter light strongly and thus may show reflection color due to bragg scattering. However, due to inevitable slight deviation in pore diameter or position, the white color from random multiple scattering would be dominant. To address this issue, heat treatment was done under nitrogen, in which polystyrene was partially carbonized and they could show clear structural color. Therefore, those macroporous particles can be used as non-bleaching pigments. Furthermore, they could be useful as electrode for dye-sensitized solar cells due to their strong light scattering property or cathode materials for Li-ion battery due to fast ion transport inside pores. In this presentation, I will review several methods for fabricating those porous particles by colloidal templating process and their applications.