

Engineered colloidal crystals with tunable optical properties

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Abstract:

In recent years, there has been tremendous activity in an attempt to fabricate and investigate the structure-property relationship of three-dimensional (3D) photonic crystals. A key property of these materials is the presence of a photonic band gap, analogous to electronic band gap in a semiconductor, which arises from the inhibition of the electromagnetic waves propagation over a certain range of frequency. Thus photonic crystals are promising tools to manipulate, confine, and control light. As they can be readily assembled into long-range ordered lattices, monodisperse colloidal particles are suitable building blocks for the elaboration of such materials.

Several methods have been developed to organize colloids in such periodic arrays with well-defined crystal structures, sufficiently domain sizes and well-controlled thickness. Nevertheless, the formation of 3D lattices with arbitrary structures, which should exhibit interesting optical functionality, has met with limited success by using all of these procedures.

We present here the fabrication by the Langmuir-Blodgett technique of: 1) multilayer crystals with a perfect control of the thickness of each of their component stacks; 2) three-dimensional colloidal crystals containing planar defects of various types. We investigate the structure-optical properties relationship of these materials by combining Scanning Electron Microscopy (SEM) and Near-Infrared (NIR) spectroscopy experiments.

Brief Biography:

Professor Serge Ravine was born in 1968 in Metz, France. He received an Engineer Diploma from the National School of Chemistry and Physics of Bordeaux in 1991 and a PhD in Physical Chemistry at the University of Bordeaux in 1995. He is currently a full Professor at the University of Bordeaux and his research interests at the Centre de Recherche Paul Pascal in Pessac (France) include the synthesis of hybrid colloidal particles and the fabrication of three-dimensional colloidal photonic crystals.

