For immediate release
25 June 1999

HKUST DEVELOPS NEW PHOTONIC MATERIALS

Controlling the behavior of particles suspended in a fluid is critical whether you are trying to mix paint or refine crude oil. Scientists at the Hong Kong University of Science and Technology (HKUST) are taking the control of particle properties in solution to new heights in their efforts to create useful photonic materials.

Prof Ping SHENG, Head of HKUST's Physics Department, and his colleagues have recently demonstrated a new type of photonic crystal with band gap and tunable crystal structure (*Physics Review Letters* 82, May 1999). In its June 17th issue, the internationally renowned science magazine *Nature* selected this discovery for its importance and innovation to be the picture story in its "News and Views" column.

Crystals with lattice constants ranging from a few thousand angstroms to tens of microns constitute an interesting class of artificial material with unique photonic properties. At present there are only a few ways of making them. Prof Sheng and his colleagues coated micrometre-sized glass spheres with nickel, lead zirconate titanate, and titanium oxide. The coated spheres were then randomly dispersed in silicon oil. When an electric field was applied and increased, the particles formed columns (as shown in Fig. 1) and further structural changes were observed as a magnetic field was applied.

By freezing the system at different field strengths and taking cross-sectional micrographs, Prof Sheng and his co-workers discovered that as the magnetic field increases, the spheres change from a body-centered tetragonal structure to a face-centered cubic structure (Fig. 2). This transition can be achieved simply by varying the relative strengths of the external magnetic fields.

Prof Sheng said: "These types of tunable structural photonic crystal not only open up a new research field, but also promise many applications. For example, with their ability to amplify light of specific wavelength they can be used to make miniaturized infrared laser equipment. And with their ability to hold atoms in an excited state for extended periods, they can be used in researching excited-state molecular chemical reactions."

Note to Editors:
The press release and photos can be downloaded at *http://www.ust.hk/~webopa/news/1999_News/news0625.html.* For further information, please contact Mr King Cheng of the Office of University Development and Public Affairs at 2358-6305 or email *pamedia@ust.hk*.