

Smart Dust: Photonic crystals derived from nanocrystalline porous Si and their applications in sensors and medicine

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The synthesis of nanostructured porous silicon films and particles that possess the properties of photonic crystals will be described. The chemistry and materials science that allows the use of these materials in remote chemical sensing, medical implant, and high throughput screening applications will be described. With appropriate modification of the electrochemical preparation conditions, multilayered structures can be generated that behave as 1-D photonic crystals. These structures can be encoded and used as remote sensors for chemicals. For example, small particles of nanoencoded microporous Si are used to detect volatile organic compounds in the environment. The intensity and wavelength of reflected light is determined in part by the refractive index of the porous nanostructure, which can be modified by adsorption of vapors within the porous matrix. High throughput screening, biosensing, and in-vivo drug delivery applications of these encoded particles will also be discussed.