MEM's Modulated Photonic Crystals

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Engineering design is sometimes inspired by Nature. The natural world is filled with crystals, periodic structures that interact with Schrodinger Waves. Drawing on this analogy, we are designing artificial crystal structures which are intended for Electromagnetic Waves instead. This has now unleashed the collective scientific imagination, engendering a profusion of synthetic electromagnetic crystal structures. In correspondence to semiconductor crystals these usually have an electromagnetic bandgap, a band of frequencies in which electromagnetic waves are forbidden. We will present a pictorial portfolio of various 2 and 3 dimensional crystal structures which have been conceived, and indicate the applications, such as opto-electronic light emitters, radio antennas, and color pigments, for which they are intended.

In photonic crystals there can be localized electromagnetic modes that result from "donor" defects, and "acceptor" defects in the periodic structure. The frequencies of these localized modes is sensitively controlled by the exact position of a very tiny dielectric "impurity". Thus photonic crystals can be exquisitely sensitive to very small motions or movements of a very tiny amount of dielectric material. This may translate to a very high speed of MEM's modulation speed of the photonic crystal switching properties. In addition, due to the inherent miniaturization of photonic crystals, a high level of complexity can be accommodated, allowing for example, large, high speed switchable arrays.

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