Abstract Submitted
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Experimental and Theoretical Studies of Photonic Band gaps in Artificial Opals[1] LEI WANG, Physics and Astronomy, USC, Columbia, SC 29208, MING YIN, FOUZI ARAMMASH, Physics/Engineering, Benedict College, Columbia, SC 29204, TIMIR DATTA, Physics and Astronomy, USC, Columbia, SC 29208 — Photonic band structure and band gap were numerically computed for a number of closed packed simple cubic and Hexagonal arrangements of non-conducting spheres using "Finite Difference Time Domain Method". Photonic gaps were found to exist in the simple cubic overlapping spheres with index of refraction (n) >3.2. Gap increased linearly from 0.117- 0.161 (1/micron) as lattice constant decreased from 0.34 to 0.18 (micron). For less than 3.2 no gap was obtained. Also, no gaps were obtained for hexagonal packing. UV-VIS reflectivity and transmission measurements of polycrystalline bulk artificial opals of silica (SiO_2) spheres, ranging from 250nm to 300nm in sphere diameter indicate a reflection peak in the 500-600 nm regimes. Consistent with photonic band gap behavior we find that reflectivity is enhanced in the same wavelength where transmission is reduced. To the best of our knowledge this is the first observation of photonic gap in the visible wave length under ambient conditions. The wave length at the reflectance peak increases with the diameter of the SiO_2 spheres, and is approximately twice the diameter following Bragg reflection.

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