Advanced 3D Photonic Crystals Structures As Challenges: Robot-Aided Manipulation V Selfassembly

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In the search for ever better performing photonic band gap structures several routes have been explored, especially those concerning the architectures and the materials. The materials flank seems impossible to exhaust: new materials, synthesis methods and infiltration techniques are being explored every day and there lies its strength. The structural side, however, is perceived as having reached a general consensus as to what the ideal structure is and all that remains is finding and developing new techniques to realize it. This ideal structure is that of the diamond lattice in its various incarnations. Generally these have been realized with great success through expensive, albeit mature, techniques such as those employed in microelectronics.[i] For this lattice the selfassembly strategies have largely remained elusive[ii] forcing the use of robot aided techniques for building structures from the bottom up.[iii] The latter, however, while elegant remains little more than an academic demonstration in need of industrial development. In the meanwhile the clear advantages of the diamond lattice are being compensated by the rich provision of properties and functionalities different materials can provide.[iv]

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[i] C. López *"Three dimensional photonic bandgap materials: semiconductors for light"* J. Opt. A: Pure Appl. Opt. **8** R1-R14 2006.
[ii] A. M. Kalsin et al. *"Electrostatic Self-Assembly of Binary Nanoparticle Crystals with a Diamond-Like Lattice"*, Science, **312**, 420
[iii] F. García-Santamaría et al. *"Nanorobotic manipulation of microspheres for on-chip diamond architectures"*, Adv. Mat. **14**, 1144-1147 (2002).
[iv] C. López, *"Materials aspects of photonic crystals"* Adv. Mater. **15**, (20) 1679-1704 (2003)