Symposium J

Title: Photonic Polymers

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Photonic molecules are mesoscopic heirarchical structures, constructed from "monomer" units with typical dimensions of 1 - 5 µm, that function as coupled optical resonators. These structures are so named because they confine electromagnetic fields in modes that are closely analogous to bonding and antibonding electronic molecular orbitals in real molecules. Recently, we discovered an interesting material property of a simple water-soluble polymer-blend that allowed us to realize a new kind of polymer microsphere-based structure that we called photonic *polymers.* Using a linear quadrupole to manipulate the particles in space, we are able to take advantage of modified surface structure in the blend-particle to actively assemble particles in programmable two- or three-dimensional architectures. Strong resonance features in fluorescence are observed near the intersection between linked spheres that cannot be interpreted with a two-dimensional (equatorial plane) model. Three-dimensional ray optics calculations show long-lived periodic trajectories that propagate in great circles linked at an angle with respect to the plane containing the sphere centers. A number of interesting applications are anticipated for these structures including optical fan-outs, frequency manipulation (e.g. add-drop) devices, 3-D conductive vertical wires/supports, and new sensor technologies.

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