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Amplified spontaneous emission in an opal infiltrated with CdSe/titania sol-gel GARRY MASKALY, MELISSA PETRUSKA, JAGJIT NANDA, ILYA BEZEL, RICHARD SCHALLER, VICTOR KLIMOV, Los Alamos National Laboratory — The emission spectra of semiconductor, colloidal nanocrystals (NCs) and the stop band positions in photonic crystals (PCs) are individually tunable through the respective sizes of the NCs and the particles comprising the PC lattice. This tuning allows the two components to be matched over a wide variety of wavelengths. An increased photonic density of states and a reduced group velocity at the photonic band edge (even a pseudogap edge) increases the interaction time between the light and the active material, potentially lowering the threshold for amplified spontaneous emission (ASE) and lasing. In this work, we present a composite consisting of a polystyrene opal infiltrated with CdSe NC/titania sol-gel. This structure exhibits ASE despite a NC volume loading of less than 3blue shift in the ASE of the sol-gel is observed relative to a CdSe/sol-gel control. The two wavelengths shift to an identical frequency at the pseudogap edge where the group velocity is expected to be a minimum. This work is a step toward NC/PC lasers tunable over a wide spectral range.

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