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# Inducing and Erasing of Defect State in Polymerized Microgel Colloidal Crystals via External Stimuli

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**Abstract:** It remains a big challenge to introduce artificial extrinsic defects into colloidal crystals, which is critical for them to function as photonic crystals. The introduction of smart defects capable of responding to external stimuli is even harder. Here poly(N-isopropylacrylamide) (PNIPAM) microgel colloidal crystals doped with poly(N-isopropylacrylamide-co-acrylic acid) (P(NIPAM-AAc)) microgel were obtained by self-assembly of the two microgels with the same size. The crystalline structure was then stabilized in situ by photo-initiated polymerization of the vinyl groups on surface of the PNIPAM microgel. Defect state can be facilely induced and then erased reversibly by changing pH or temperature, taking advantage of the different response of the two microgels to external stimuli. The defect state can be induced and erased repeatedly. In addition, the response of the doped crystals is fast because of their inherent porous structure.

**Keywords:** colloidal crystals; artificial defects; defect state; microgels; stimuli-responsive

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