Controlled Ion Exchange Balance in In^{3+} for Cu^{+} Cation Exchange of $Cu_{3-x}P$ Nanoplatelets

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Synthesis of colloidal nanocrystals (NCs) which are not readily available via wet-chemical approach based on arrested precipitation has often relied on templated growth. Cation exchange, in which guest cations in bulk solution replace host cations in template NCs, has evolved as one of the most powerful examples. Despite its versatility and facileness, there are caveats, because most of the cation exchange processes presuppose the formation of crystalline defects which are more or less uncontrolled in terms of population and locations. The defect formation is a consequence of the imbalance between extraction and incorporation of host and guest cations. Here, we demonstrate the controlling of ion exchange balance in In^{3+} for Cu^{+} cation exchange reaction of $Cu_{3-x}P$ nanoplatelets (NPLs), which triggers nanoscale Kirkendall effect, a representative phenomenon of crystal defect generation, clearly shown by morphology change of NPLs.