

### Cation exchange as a tool for complex heterostructure and multi-component junction

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Cation exchange reactions in ionic nanocrystals has been used as a tool for heterostructuring of the nanocrystals by only replacing partial cations in crystal lattice. Through selective cation exchange, a new type of composition or crystal structure in heterostructure could be realized. Herein, we designed more complex 3-composition nanocrystal based on the difference of reactivity in cation exchange reaction. When 2-component heterostructure is used for cation exchange, the reaction initially progresses from highly reactive crystal. However, when introduced cations encounter non-reactive crystal, a direction of the reaction can be largely changed to avoid the non-reactive one. This approach makes unique and complex heterostructured nanocrystals possible.