First Cationic Uranyl-Organic Framework with Anion Exchange Capabilities

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By controlling the extent of hydrolysis during the self-assemble process of zwitterionic-based ligand with uranyl cations, we observed a structural evolution from a neutral uranyl organic framework \([\text{[UO}_2\text{TTTPC(OH)O(COOH)]·1.5DMF·7H}_2\text{O}} \text{ (SCU-6)} \) to the first cationic uranyl organic framework with the formula of \([\text{[(UO}_2\text{HTTTPC(OH))]Br·2.5DMF·4H}_2\text{O}} \text{ (SCU-7)} \). The crystal structures of SCU-6 and SCU-7 are layers built with tetranuclear and dinuclear uranyl cluster respectively. Exchangeable halide anions are present in the interlaminar spaces balancing the positive charge of layers in SCU-7. Therefore, SCU-7 is able to effectively remove perrhenate anions from aqueous solution. Meanwhile, the \text{H}_2\text{PO}_4^−\text{-exchanged SCU-7 materials exhibits a moderate proton conductivity of 8.70 ×10^{-5} \text{ S cm}^{-1} \text{ at 50 °C and 90 % relative humidity, representing nearly 80 times enhancement compared to the original material.}}

Fig.1. Simulation process TeO_4^2– exchange using SCU-7

REFERENCES