

Poster Presentation

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Conductive hybrid crystals comprising oxide clusters and surfactants

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Conductive hybrid layered crystals were successfully constructed by employing polyoxometalate anionic clusters and cationic surfactants. Such ionic crystals are a rare series of materials, and both polyoxometalate and surfactant components can be flexibly selected to construct functional inorganic-organic hybrids [1-3]. Their layered structures contribute to the emergence of conductive property. The conductivity was estimated by alternating current (AC) impedance spectroscopy. Decatungstate (W10) and tetramolybdate (Mo4) anions formed stable single crystals together with hexadecylpyridinium (C16py), and the crystal structures were revealed by X-ray diffraction analyses. The crystals exhibited the alternate stacking of W10 or Mo4 layers and surfactant layers. The obtained conductivity values were in the range of 10^{-6} to 10^{-5} S cm⁻¹ order over 423 K. On the other hand, decavanadate (V10) anion formed layered crystals with alkyltrimethylammonium (Cn, n = 10 – 16). The hybrid crystals contained diprotonated V10 anions, and exhibited proton conductivity at intermediate temperatures (> 373 K) without humidification. The conductivities for C14-V10 and C16-V10 were ca. 1×10^{-4} S cm⁻¹ over 393 K under argon atmosphere. Anhydrous proton conduction is crucial property for fuel-cell technology, and V10-surfactant crystals are possible candidates for proton-conducting electrolyte of fuel cells. The polyoxometalate-surfactant hybrid crystals having appropriate combination would pave a way to another class of hybrid conductors.

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