Metal-Polymer Framework Monolayers at Oil/Water Interfaces

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Interfacial complexes at fluid/fluid interfaces (e.g. the air/water interface and oil/water interfaces) are intensively studied for their applications as ultra-thin functional films or membranes. Although mechanically excellent and rapidly forming complexes such as polyelectrolyte complexes, nanoparticle surfactants, and size selective two-dimensional (2D) metal organic frameworks (MOFs) and 2D covalent organic frameworks (COFs) have been independently developed, it is still a great challenge to achieve complexes with all these advantages. In this work, such novel interfacial complexes are developed as monolayers at oil/water interfaces by the combination of metal ions and surface-active end-functionalized polymers. Stable and rapid coordination bonds between metal ions and functional groups working as ligands lead to excellent mechanical properties and rapid complexation as well as porous structures whose pore size can be adjusted by the lengths of polymer chains. The development of these interfacial complexes is believed to be a significant advance in micro-flow/batch reactors and molecular storage/separations.