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Nanosheet Formation in Sandwich-like Reaction Field

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Metal organic frameworks (MOFs) are a family of hybrid nano-porous materials that are formed by the coordination of metal ions with organic ligands. In particular, MOFs with 3-D networks can be scaled down to nanometer size, which makes them potentially useful as nanocarriers in medical applications. For exfoliatable MOFs with 2-D networks, the nanosheets (NSs) are also available by several methods. However, these methods are not applicable to MOFs with 3-D networks. To resolve this problem, we have recently proposed a new method to synthesize NSs by using a hyperswollen lyotropic lamellar (HL) phase composed of bilayers of a non-ionic amphiphile. The accumulation and reaction of hydrophobic or hydrophilic ingredients in the thin hydrophobic or hydrophilic region inside the bilayers several hundreds of nanometers apart from each other in the HL phases of aqueous or organic amphiphilic solutions should result in sufficiently dispersed very thin hydrophobic or hydrophilic NSs. In fact, hydrophobic polystyrene NSs have been successfully synthesized in the thin hydrophobic regions in the sandwich-like reaction fields (SRFs) inside the bilayers of HL phases of aqueous amphiphilic solutions. Here we describe the synthesis and unique gas adsorption behaviour of the first example of NSs of elastic layer-structured metal-organic frameworks (ELM-NSs). The thickness and horizontal width of the ELM-NSs obtained from a new synthetic method using HL phases as SRFs are a few nanometers and several hundreds of nanometers, respectively. We also performed N₂ and CO₂ adsorption measurements, and demonstrated that the gate-opening pressure depends on the thickness.

Biography

I am Takeru Omiya and Japanese student from Osaka University. My research interests fall at the interphase of Chemical Engineering and Materials Science, including the development and demonstration of new nano-structured materials and composites.

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