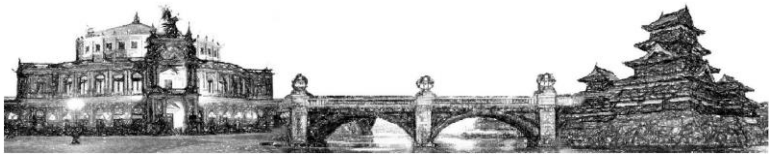

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Nano- to Mesoarchitectonics with Molecularly Thin 2D Oxide and Hydroxides

Takayoshi Sasaki*
International Center for Materials Nanoarchitectonics (WPI-MANA), National Institute for Materials Science (NIMS)
Sasaki.takayoshi@nims.go.jp, http://www.nims.go.jp/softchem/index.html

Various layered metal oxides and hydroxides have been delaminated into colloidal single layers via massive swelling [1]. The obtained molecularly thin nanosheets are attractive as a building block to construct unique artificial materials, because they are monodispersed and charged 2D nanocrystal and show a range of useful properties. We apply solution processes to organize them into various nano- to mesoarchitectures.

The oxide and hydroxide nanosheets are oppositely charged and, therefore, simple mixing of their suspensions spontaneously brought about molecular-level heteroassembly into oxide/hydroxide superlattice structures[2]. We showed that such heteroassembled lamellar composites of reduced graphene oxide (rGO) and transition metal hydroxide nanosheets exhibited high performance in electrochemical charging/discharging and water electrolysis, showing promise for applications in supercapacitors and electrocatalysts[3,4].

Novel lamellar structures having mesoscale separation of 2D oxide sheets could be produced through hydration-driven gigantic swelling of layered metal oxide crystals[5] or alignment of exfoliated nanosheets under the high magnetic field[6]. The intersheet separation could be varied from several to several hundred nm by controlling the electrolyte concentration, resulting in intriguing properties.

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