How to make various materials into nanosheets

Using a bilayer membrane as a reaction field : "TRAP method"

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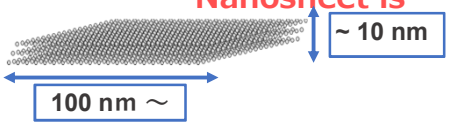
1. Background

Nanosheet is …



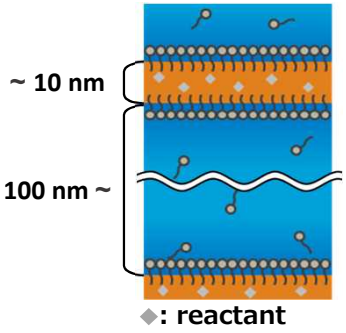
・Thichkness << Width
⇒ aspect ratio > 100
・ High specific surface area
⇒ unique functions

(Conventional Nanosheet Synthesis Methods)
・Top-down method (ex. Exfoliation of layered materials)
Only for layered materials
・Bottom-up method (ex. CVD, Hydrothermal synthesis)
Only to give thick nanosheets. Specific equipment may be required.

A simple method to fabricate nanosheets with "several nm thickness," and it should have "applicability to various materials".

2. Principle of the Invention

Two-dimensional Reactors in Amphiphilic Phases (TRAP) method



(Bilayer) thichness: several nm
width: several hundreds nm

Nanosheets grow up in a bilayer of "Hyperswollen lamellar phase" as a reaction field."

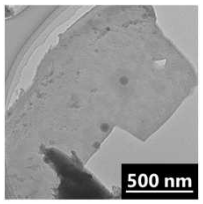
"Thin" nanosheets of "a wide range of materials"

- The use of a "two-dimensional" reaction field can make the product very thin.
- The procedure is simpler than the conventional methods, and the applicability is broader.
- Stable nanosheets dispersion can be obtained.

3. Obtained Nanosheets

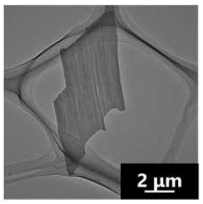
[Hydrophobic Nanosheets]

・Carbon



(Thickness) = 6 nm

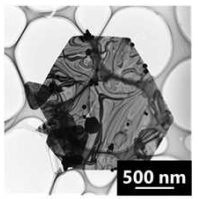
・MOF



(Thickness) = 2 nm

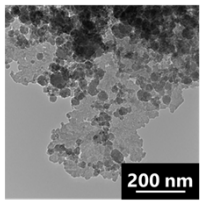
[Hydrophilic Nanosheets]

・Gold



(Thickness) = 6 nm

・Aluminosilicate



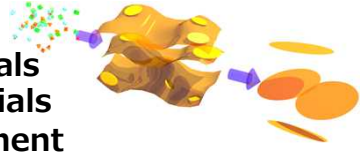
(Thickness) = 1.5 nm

- Nanosheets of hydrophilic and hydrophobic materials can be synthesized by selecting a surfactant and a solvent.
  Ex) Carbon, MOF, and metal nanosheets are available.
- Some nanosheets show unique properties.
  Ex) MOF nanosheets show higher gate open pressure than bulk samples of the same MOF.

4. Applications

Performance improvement of various functional materials

・Large specific surface area
・Aggregation inhibition
・Stable dispersion



- Catalysts
- Porous materials
- Coating materials
- Surface treatment
- Separation/Adsorption materials

5. Patent Licensing Available

Metal Organic Structure Nanosheet and Production Method Therefor

Patent No.: WO2018/016650 (JP, US)

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