

# Success in synthesis of new high performance functional material mesoporous prussian blue

January 5 2012, By Mikiko Tanifuji

---

The National Institute for Materials Science in Japan succeeded in fabricating mesoporous Prussian blue, in which an extremely large number of nanosized pores (mesoporous) are formed in the crystal structure of the material.

This research result was achieved by a team headed by Dr. Yusuke Yamauchi, a MANA Scientist at the NIMS International Center for Materials Nanoarchitectonics, and Dr. Hu Ming, who is a Postdoctoral Researcher at MANA.

Prussian blue has a high cesium adsorption capacity, on the same level as natural minerals such as [zeolite](#). To date, various attempts have been made to increase the adsorption capacity of Prussian blue by increasing its surface area by refinement/fabrication of [mesoporous materials](#). However, with the conventional synthesis process for mesoporous material, the [crystallinity](#) of Prussian blue was greatly reduced by refinement, and the expected increase in surface area was not obtained. Therefore, the development of a new [synthesis technique](#) which increases the area of Prussian blue while maintaining its crystallinity, and thereby maximizes its adsorption capacity, was indispensable.

In this work, the NIMS researchers succeeded in fabricating nanoporous Prussian blue using a new etching type synthesis method. As illustrated in the accompanying figure, it was possible to induce [spontaneous](#)

[formation](#) of an extremely large number of nanopores in particles of Prussian blue by adding water-soluble macromolecules to a solution in which [nanoparticles](#) of Prussian blue had been dispersed and stirring the resulting solution under an acidic condition.

The surface area showed a high value of more than  $330\text{m}^2/\text{g}$ , which is the largest area reported for Prussian blue until now and is also more than 10 times larger than the area of commercial Prussian blue particles. In a cesium adsorption experiment using this mesoporous Prussian blue, cesium adsorption was more than 8 times greater than that with the commercial Prussian blue. It is thought that a similar adsorption capacity can be expected in seawater. In order to further increase the [cesium](#) adsorption capacity of Prussian blue by metal replacement, the research team is attempting to apply this technique to Co-Fe Prussian blue analogues, etc. In the future, tests of these materials as adsorbents will be conducted, and development will be carried out with the aim of simplifying the process. As a result, development approaching practical applications, beginning with application to mass production, is expected.

The results were on December 19, 2011 in the online edition of the *Angewandte Chemie International Edition* (published by the German Chemical Society).

Provided by National Institute for Materials Science

Citation: Success in synthesis of new high performance functional material mesoporous prussian blue (2012, January 5) retrieved 19 April 2024 from <https://phys.org/news/2012-01-success-synthesis-high-functional-material.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.