Novel Nanoporous Carbon-Silica Composite

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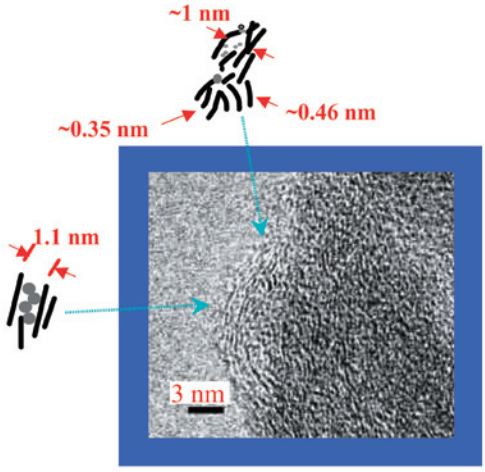
The objective of this research is to create nanoporous materials ideal for CH_4 storage by physically and chemically functionalizing the layered compound precursors with very thin walls via the modern nanoprocessing technology such as intercalation, soft chemical template method, etc. Recently, we succeeded in synthesizing a novel nanoporous carbon-silica composite by this route which has medium hydrophilicity and could be expected for applications which require both hydrophobic circumstances and the role of intercalated active species.



TEM image of nanoporous carbon-silica composite

Organic-Inorganic Hybrid Materials for VOC Gas Sensors

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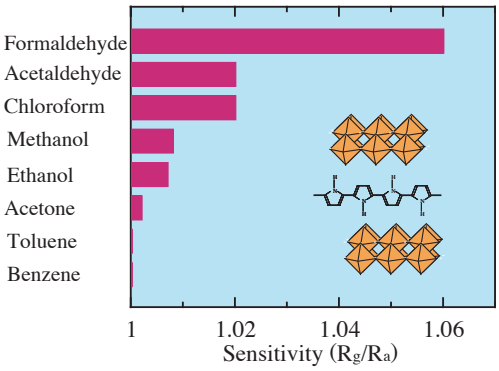
We have proposed intercalative type organic-inorganic hybrid materials as the chemical sensors for detection of volatile organic compounds (VOCs). The organic and inorganic components take part in molecular recognition and transduction of chemical signals to measurable resistance changes, respectively. We tested this idea with polypyrrole intercalated MoO_3 hybrid materials, $(PPy)_xMoO_3$, with a layered structure. The $(PPy)_xMoO_3$ pressed pellets show a distinct response to VOCs by increasing in their electrical resistivity. $(PPy)_xMoO_3$ exhibits higher sensitivities to polar analytes such as formaldehyde and acetaldehyde, whereas it showed almost no response to toluene and benzene.



VOC gas sensing properties