

**Abschlussarbeit Bachelor/Master:**  
**Surface Modification of Ordered Mesoporous Silica for Water purification**

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**Sprache:** English

Since their invention in the early 1990s, ordered mesoporous silica (OMS) materials are investigated for a wide range of environmental and medical applications, e.g. catalysis, separation, sorption, medicine or as hard-templates for the synthesis of other mesoporous materials. This is due to the large specific surface areas, high pore volumes, highly ordered pore structures and uniform pore sizes of OMS. To further extend the application areas of OMS materials, the modification of OMS in terms of pore size and surface functionality is recently under intensive investigation.

The aim of this work is to investigate the surface functionalization of ordered mesoporous silica with organic groups as  $-\text{COOH}$ ,  $-\text{SH}$  and  $-\text{NH}_2$  as well as with graphene oxide, while maintaining the high surface area and pore ordering of the original OMS material. Thus, OMS will be prepared by a scaled-up batch-synthesis and grafted with functional groups afterwards by chemical reflux methods. The resulted powders will be tested for water purifications from toxic heavy metals and organic dyes. The work could also be extended to fabrication of liquid membrane from the ceramic powders for separating oil/organic hazards from water.

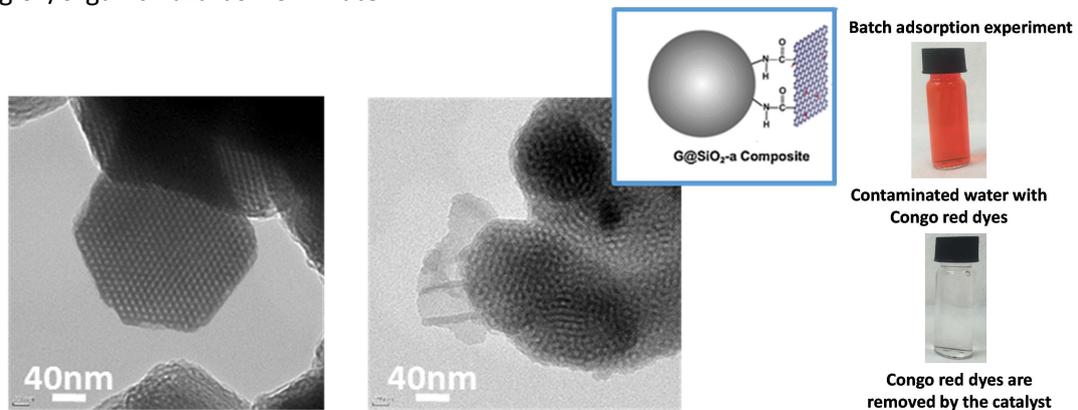


Fig. 1. TEM images of left) Nanoporous structure of the OMS, right) Graphene Oxide on OMS.

The students will learn the following:

Methods:

- Synthesis of ordered mesoporous silica
- Surface modification with functional organic groups as  $-\text{NH}_2$ ,  $-\text{SH}$ ,  $-\text{COOH}$
- Surface modification with graphene oxide
- Membrane fabrications
- Batch adsorptions experiments of heavy elements and organic dyes
- Permeability test of fabricated membranes
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Characterization

- Nitrogen adsorption, Small-angle X-ray diffraction, Transmission electron microscopy, Scanning electron microscopy, Attenuated total reflection infrared spectroscopy, Thermal analysis, UV spectrophotometer, Inductively coupled plasma spectrometry, Membrane permeability tests.