

HELMHOLTZ RESEARCH FOR
GRAND CHALLENGES

Position Profile for Chinese Applicants running for 2019 Helmholtz – OCPC – Program

PART A (Info about the Position)

Title of the project:

In situ transmission electron microscopy of catalysts for methane dry reforming

Helmholtz Centre and institute:

Forschungszentrum Jülich
Ernst Ruska-Centre for Microscopy and Spectroscopy with Electrons

Project leader:

Prof. Dr. Rafal E. Dunin-Borkowski, Dr. Marc Heggen

Email address

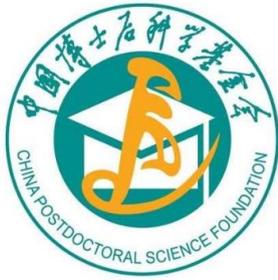
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Description of the project (max. half page):

Dry reforming of methane (DRM) is a convenient way to reduce the emission of two climate poisons (CO_2 and CH_4) and to generate carbon monoxide/hydrogen mixtures, so-called “syngas”, which can be further converted to valuable products. Catalysts for DRM include Ni, Cu and Pd nanoparticles on substrates such as Al_2O_3 , MgO, CeO_2 and TiO_2 . In addition, complex oxides such as perovskites and spinel phases of varying composition, such as LaNiO_3 and La_2NiO_4 , are promising DRM catalysts. These materials exsolve transition metal particles during reduction, creating a metal/oxide system of defined composition, which acts as active catalyst material. The aim of this project is to analyze a wide range of DRM catalysts under realistic reactive atmosphere conditions in the transmission electron microscope, in order to identify their structural evolution and degradation and to establish structure-activity relationships. In the first part of this project, metal nanoparticle catalysts on oxide substrates will be investigated on the atomic scale using *in situ* electron microscopy. In a second step, *in situ* experiments will be performed on complex perovskites and spinel-based catalysts. It will be especially important to understand the formation of the catalytic active DRM phase by the exsolution of Ni nanoparticles from the substrates under realistic conditions.



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Required qualification of the post-doc:

- PhD in materials science, chemistry or a related discipline
- Experience with advanced transmission electron microscopy
- Additional skills in catalysis