ENDO- AND EXO-TEMPLATED MATERIALS FOR WATER SPLITTING

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ABSTRACT

Nowadays, the main energy source of the society is based on the fossil fuels; however, a sustainable energy supply is required by considering the rising demand for the energy and also related environmental issues. Among all renewable alternative energies, solar energy has the largest potential to achieve this target, since the sun delivers enormous amount of the energy as irradiation to the earth's surface. Solar water splitting that results in clean hydrogen is an applying strategy to converts the solar energy to chemical energy for the storage.[1] In spite of decades of research, a material that fulfills all the technical and economic requirements for effective solar energy conversion to fuel production has not been discovered yet. Thus, novel materials are needed to be designed and engineered.[2]

Endo and exo-templating routes are frequently used to create nanostructured materials, in particular for synthesis of nanostructured porous materials.[3] In this lecture, some specific examples of templating strategies for the design and engineering of inorganic and hybrid nanostructured materials and their application for photo- and electrochemical water splitting will be presented. For the photocatalysis part, the main emphasis will be on preparation of mesostructured composite tantalates semiconductor through endotemlating method where influence of junctions between two different phases on the performances of the photocatalysts will be demonstrated.[4] In case of the electrochemical water splitting part, exotemplating methodology will be presented for the electrocatalysts preparation. A model system based on ordered mesoporous cobalt and mixed oxides will be discussed, which allows to evaluate the importance of some key physical and chemical parameters for electrolysis of water toward design of more effective catalysts.[5,6] At the end, some alternative and practical templating strategies will be presented to synthesize nanostructured inorganic oxides and hybrid perovskite based materials.[7-9]

REFERENCES

[1] T. Grewe, M. Meggouh, H. Tüysüz, *Chem. Asian J.* **2016**, *11*, 22-42.
[2] B. Konkena, K. J. Puring, I. Sinev, S. Piontek, O. Khavryuchenko, J. P. Durholt, R. Schmid, H. Tüysüz, M. Muhler, W. Schuhmann, U. P. Apfel, *Nat Commun* **2016**, *7*, 12269.
[3] X. H. Deng, K. Chen, H. Tüysüz, *Chem Mater* **2017**, *29*, 40-52.
[4] T. Grewe, H. Tuysuz, *J. Mater. Chem* **2016**, *4*, 3007-3017.
[5] X. H. Deng, W. N. Schmidt, H. Tüysüz, *Chem Mater* **2014**, *26*, 6127-6134.
[6] T. Grewe, X. H. Deng, H. Tüysüz, *Chem Mater* **2014**, *26*, 3162-3168.
[7] a) X. Deng, C. K. Chan, H. Tüysüz, *ACS. App. Mater. Interfaces* **2016**, *8*, 32488-32495.
[8] X. H. Deng, H. J. Bongard, C. K. Chan, H. Tüysüz, *ChemSusChem* **2016**, *9*, 409-415.
[9] K. Chen, H. Tüysüz, *Angew Chem Int Edit* **2015**, *54*, 13806-13810.

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