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Graz, January 22nd 2015

Certificate

We certify the successful scientific collaboration of **Prof. Dr. Andrey Rempel** with the Institute of Materials Physics, Graz University of Technology, Graz, Austria in the period from January 9th to February 10th , 2015.

During his stay at the institute he participated in experiments on the study of atomic defects in solids by positron annihilation techniques and he gave a scientific lecture on "Semiconductor nanocomposites for green energy production by solar photocatalysis".

University Professor, Dr.
Roland Würschum

Head of the Institute of Materials Physics
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Einladung zum Seminarvortrag

Semiconductor nanocomposites for green energy production by solar photocatalysis

Prof. Dr. Andrey A. Rempel

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&
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Semiconductor materials are widely used in photocatalytic processes. Controlled photocatalytic reactions for organic synthesis, photocatalytic oxidation of organic compounds, and photocatalytic hydrogen production have become of special significance. Nowadays, titania TiO_2 is the most widely used photocatalyst of such reactions. The major drawback of TiO_2 is its low photoactivity under sunlight reaching the surface of the earth. Its inertness is caused by the too wide band gap, which varies from 3.1 to 3.3 eV depending on the crystalline modification of TiO_2. Nanocrystalline TiO_2 which is used as a photocatalyst has even wider band gap due to blue shift. From the other hand there is a great number of substances that exhibit photocatalytic activity under sunlight. Among them, cadmium sulfide CdS attracts special attention since its band gap can be set narrower than that of TiO_2 even in the nanocrystalline state. However, CdS alone shows a high degradation rate of its chemical composition in many photocatalytic processes. A solution to this problem lies in the synthesis and exploring of TiO_2-CdS nanocomposites. In CdS–TiO_2 hybride nanoparticles the lower boundary of the light sensitivity range can be shifted from 360 to 510 nm. This shift is useful in practice and is caused by the fact that CdS absorbs photons and then transfers an excited electron to TiO_2. This leads to a considerable enhancement of the photocatalytic activity of TiO_2, which enables the photocatalytic decomposition of organic compounds, as well as water splitting for hydrogen production, without special ultra violet illumination.

In present talk the review [1] and the discussion will focus on the synthesis of visible light photocatalysts based on TiO_2-CdS hybrid nanoparticles, on their nanostructure and morphology and on the catalytic properties and applications of such nanocomposite photocatalysts. Special attention is given to chemical condensation of capped CdS nanoparticles, sol-gel synthesis of TiO_2 nanoparticles, structural characterization techniques including small-angle scattering, degradation problems and mechanism of catalytic activity.

[1] Rempel, A. A., *Hybrid nanoparticles based on sulfides, oxides, and carbides (Review)* Russian Chemical Bulletin **62** 857-868, 2013

Zeit:	Donnerstag, 22.Jänner 2015, 16:00 Uhr
Ort:	TDK-Seminarraum des Institutes für Experimentalphysik, Erdgeschoß, Raum-Nr. (PHEG016)
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