



TECHNISCHE
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IAP-SEMINAR

EINLADUNG

Termin: **Dienstag, 6.5.2014 um 16:00 Uhr**
Ort: **Technische Universität Wien,
Institut für Angewandte Physik,
Seminarraum 134A, Turm B (gelbe Leitfarbe), 5. OG
1040 Wien, Wiedner Hauptstraße 8-10**

Vortragender: **Ulrich Gesenhues**
Sachtleben Chemie GmbH, Duisburg/Germany

Thema: **Physics and Chemistry of TiO₂ Pigments – an Industrial View**

Kurzfassung

TiO₂ pigments are used worldwide for whitening paints, printing-inks, plastics and paper laminates, and for matting chemical fibers and polymer films. Some large-volume or high-value nonpigmentary applications of TiO₂ are also established (DeNO_x catalysts, sunscreen, wood protection). A disadvantage in pigment application is the photocatalytical activity of TiO₂ which has been reduced by inorganic coats on the crystal (not part of my lecture) and by doping. I shall illustrate the practical consequences of photoactivity, present the basic understanding of the causes that has developed in the industry, and show how this can be extended with physicochemical models for bulk and surface of the TiO₂ crystal.

First, the surface of TiO₂, pure and with adsorbed H₂O (colloidal-chemistry models, STM results and theoretical calculations from the literature), and the contributions to photoactivity from crystal bulk, subsurface layers, surface and adsorbates (electronic energy bands, O vacancy, anaerobic reversible photogreying, irreversible weathering, role of UV, O₂ and H₂O, relative rates of both photoreactions) are reviewed. In the main part of my lecture, these aspects are discussed and quantitated with own results from systematic lab investigations of rutile pigments doped with 0 – 1% Al₂O₃:

- defect structure of crystal bulk, distribution equilibrium of dopant between bulk and surface, chemical surface composition, sorption of H₂O, Arrhenius and Lewis acid-base properties of the surface, surface-OH concentrations and atomic model for the surface,
- weathering of pigmented plastics and paints: link between macroscopic and microscopic parameters, Weibull evaluation, contributions from pigment bulk and surface, and comparison to simple models for photoconductors and surface photoreactions,
- Greying of pigmented paper laminates: structure of device, reversibility of greying, contributions from pigment bulk and surface, effects of irradiation intensity, photoelectrochemical model for the bulk, contributions from adsorbates, equivalent electric circuit.

At the end of my lecture, I shall identify the gap that is now left between macroscopic industrial product performance and microscopic scientific understanding, and – if time is left – I shall comment, from 29 years of professional experience, on the global TiO₂ economy and its implications for R&D in the industry.

*Alle interessierten Kolleginnen und Kollegen sind zu diesem Seminar
(45 min mit anschließender gemeinsamer Diskussion) herzlich eingeladen.*

U. Diebold e.h.
(Seminar-Chairperson)

H. Störi e.h.
(LVA-Leiter)