● c hemisch
○ p hysikalische
g esellschaft

Gegründet im Jahre 1869 von H. Hlasiwetz,
J. Loschmidt, J. Petzval und J. Stefan

EINLADUNG

zum Vortrag von

Univ.Prof. Dr. Peter Fratzl

Max Planck Institute of Colloids and Interfaces,
Department of Biomaterials, Potsdam

Nature's nanocomposite materials – structural design principles and mechanical performance - Materialien der Natur – Bauprinzipien und mechanische Eigenschaften

am Dienstag, 27. April 2010, um 17.00 Uhr

Ort: Lise-Meitner-Hörsaal, Fakultät für Physik, Universität Wien,
1090 Wien, Strudlhofgasse 4 / Boltzmanngasse 5, 1. Stock

Barrierefreier Zugang: Boltzmanngasse 5, Lift, 1. Stock rechts über den Gang zum Hintereingang des Hörsaals

Abstract:

A large variety of natural materials with outstanding mechanical properties have appeared in the course of evolution. This includes wood, grasses, bone, sea shells or glass sponges. Biological materials are generally composites of different types of polymers and – sometimes – mineral. They are built in a hierarchical fashion, which allows the material to be optimized for its function at many different structural levels.

Bone, for example, consists in about equal amounts of a collagen-rich matrix and calcium-phosphate nano-particles. These components are joined in a complex hierarchy of fibres and lamellar structures to a material with exceptional fracture resistance. Studying bone using methodologies borrowed from materials physics improves the basic understanding of its hierarchical structure and in relation to its properties and function, but it may also help in understanding the effect of diseases and therapies, e.g., in the context of osteoporosis or bone healing.

Byssus fibres by which mussels are attached to rocks are purely organic and very extensible but also reach considerable strength and are covered by a hard abrasion resistant coating. This extraordinary mix of properties seems to be tuned by inhomogeneously distributed metal-coordination bonds which cross-link the proteins in the filament.

Plant cell walls are able to generate considerable stresses and even complex movements with changing humidity. These actuation capabilities are based on intricate cellulose fibre architectures and the water swelling of hemicelluloses. Unravelling the structural principles of these unexpected material properties may help in the understanding of these biological systems but also indicate ways on how to develop new types of biomimetic materials with exceptional properties.