

SYLICA LECTURE:

Biological materials which sustain or generate mechanical forces

You are cordially invited to the lecture delivered by

Prof. Dr. Dr.h.c. Peter Fratzl

Director, Department of Biomaterials

Max Planck Institute of Colloids and Interfaces, Potsdam, Germany

WHEN: 12/03/2014, 13:30

WHERE: 4th floor, Faculty of Chemistry, Brno University of Technology, Purkyňova 118, Brno

Abstract:

Materials with outstanding mechanical properties have appeared in the course of evolution. They are found for example in skeletons, plant stems, protective shells and cases. Many of these materials are designed to sustain continuous or occasional forces. They are generally hybrid materials comprising proteins or polysaccharides and – sometimes – mineral. They are built in a hierarchical fashion, which allows them to be optimized for their function at many different structural levels and acquire adaptive or self-healing properties.

In some cases, these materials are not only passively carrying forces but are even able to generate movement without an intrinsic chemical energy source. Indeed, many plants harvest energy from naturally occurring changes or gradients in humidity to actuate their organs, e.g., for seed dispersal or to generate internal (growth) stresses. The basis for this motility is an intricate hybrid nanostructure where one of the components swells with increasing humidity and the other redirects the loads to generate movement. The use of environmental energy sources fundamentally differentiates these materials from muscle or molecular motor mediated motility in general. Some of the structural principles observed in biological load-carrying and actuating hybrid materials will be reported and discussed in the lecture.