s7'.m2.p1 **Mechanical behaviour of hard α-keratin fibre nano-structure explored by X-ray diffraction**. L. Kreplak, F. Briki, J. Doucet, *LURE centre universitaire Bât. 209D, B.P. 34, 91898 Orsay Cedex, France.*
Keywords: keratin, coiled coils, mechanical properties.

Hard α-keratin is a protein from the intermediate filament family. The main function of these filaments is to ensure the mechanical support of the cell or of biological tissues such as skin and hair [1]. Moreover, they share a common molecular and supramolecular structure. Our aim is to correlate these structural levels with the outstanding mechanical properties of the keratin filaments.

In hard α-keratin fibres such as hair or wool, the keratin filaments, called microfibrils, are cylindrical shaped (7.5 nm in diameter), close packed assemblies of long heterodimeric keratin molecules characterised by a double stranded α-helical coiled coil central domain [2]. Laterally the microfibrils are embedded in a sulphur-rich protein matrix forming an hexagonal paracrystal [3].

In this study, we have performed mechanical experiments under various humidity conditions combined with WAXS and SAXS.

We present the mechanical stretching effects on the microfibril packing on one hand and on its internal structure on the other hand. We have observed an elastic behaviour of the coiled coil structure at low strain (beyond 3%), followed by a progressive unravelling of the coiled coil domains at higher strains. We have also observed a common behaviour of the coiled coil content and the microfibril radius. Both parameters decrease with strain. These effects have been followed as a function of water content in hair; the coiled coil unravelling process was delayed by water absorption.

Finally we show that the direct α-helix → β-sheet transition postulated by previous workers [4] is not in accordance with our results. We propose a new molecular model of keratin fibre deformation which is based on an α-helix → coil transition.

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[4] E. G. Bendit, Textile Research, Journal, 30, 547-555 (1960).

s7'.m2.p2 **Investigations on the radiation damage in organic compounds** R. Müller[1], M. Drakopoulos[2], S. Ginder[1], E. Weckert[1], and J. Zellner[1], *[1]Institut für Kristallographie, Universität Karlsruhe (TH), D-76128 Karlsruhe, Germany,[2]ESRF, F-38043 Grenoble, France.*
Keywords: instrumentation, non-crystalline biological systems.

Crystals of organic compounds especially protein crystals suffer seriously from radiation damage by intense x-rays beams. Cooling the crystals to about 100K can limit the damages by lowering the rate of thermal activated processes.

The starting point for the investigations were assumptions and reports that crystals heat up due to the absorpted radiation energy[1] for fluxes as they are available at an undulator of the ESRF. However the exact temperature is important for a number of experiments.

As a simple model for protein crystals L-asparagine monohydrate and sucrose crystals have been chosen. As an indicator for the crystal's temperature and for radiation damage the lattice parameter was measured as a function of time for different primary-beam intensities, radiation energies (0.45 - 1.0 Å) and temperatures for crystals of different size applying the Bond-method using an accurate diffractometer. The following results have been obtained:

- On almost all experiments there was no instantaneous, reversible increase of temperature detectable due to the increase of the photon flux. Only at one particular wavelength (λ = 0.6 Å) L-asparagine showed a small increase of temperature which is not understood so far.
- The increase of the lattice parameter due to radiation damage is irreversible and leads to destruction of the crystal if continued for too long.
- The rate of the increase of the lattice parameter is approximately proportional to time and monotonous in flux and temperature.

Further it was possible to obtain an estimate for the activation energy of the rate controlling process.

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