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Time-Resolved Fibre Diffraction on Human Arteries During Tensile Testing and Nanostructure Correlation to Mechanical Behavior

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The collagen diffraction patterns of human arteries under uniaxial tensile test conditions have been investigated by time resolved synchrotron small angle X-ray diffraction [1].
Different types of arteries were chosen according to their clinical interest and have been studied after dissection into their major layers (intima, media, adventitia).
Using a recently designed tensile testing device [2], the orientation and d-spacing of the collagen fibers in the layers have been measured *in situ* under physiological conditions, together with the macroscopic force and sample deformation. This allows reconstruction of true stresses and strains and the fitting of this data to a non linear mechanical model [3]. The results show a relation between the orientation/extension of the collagen fibers on the nanoscopic level and the macroscopic stress and strain. This is attributed first to a straightening, second to a reorientation of the collagen fibers, and third to an up-take of the increasing loads by the collagen fibers.

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Halogen ...halogen interactions in hexahalogenated benzenes

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Hexahalogenated benzenes ($C_6Cl_{6-n}Br_n$, $C_6Cl_{6-n}I_n$, $C_6Br_{6-n}I_n$) crystallize in two packing modes with the monoclinic and triclinic space groups $P2_1/n$ and P, respectively. The former, which is isostructural to C_6Cl_6, is more common. In C_6Cl_6, the planar molecules form Cl···Cl contacts and Π···Π stacking interactions and when crystals are compressed mechanically along their needle length, a bending deformation takes place. This bending is related to the weakness of the Cl···Cl interactions vis-à-vis the stronger Π···Π stacking interactions. The triclinic packing which is less common is restricted to molecules that have a symmetrical (1,3,5 and 2,4,6) halogen substitution. It is characterized by specific, polarization induced X···X interactions which result in threefold-symmetrical X_3-synthons, especially when X = I; this leads to a layered pseudo-hexagonal structure in which successive planar layers are inversion related. The triclinic crystals shear on application of mechanical stress because of mutual sliding of layers. The X···X interactions in the monoclinic group are non-specific while in the triclinic group, some X···X interactions are anisotropic, chemically specific and crystal structure directing.