

Towards the synthesis of bioinspired materials and investigation of their properties

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Bioinspired materials are materials that mimic the architecture and characteristics of natural materials. These materials are often developed to harness natural materials' unique features for various applications. Synthetic auxetics and artificial silk fibers are two examples of bioinspired materials discussed in the thesis.

Chapters 2 and 3 deal with the material development with an auxetic effect based on a rotating rod mechanism in elastic polymeric films. Herein, we covalently incorporated rod-like molecules into the elastic polyurethane and polydimethylsiloxane. The molecular orientation of the rod-like molecules upon uniaxial elongation was monitored using polarized UV-vis spectroscopy and linear dichroism. The polymer films with covalently attached rod-like molecules into polymer matrices showed a negative linear dichroism upon elongation and oriented perpendicularly. Furthermore, theoretical studies coupled with thermomechanical analysis substantiate the possibility of auxetic effect in these rod-incorporated polymeric materials.

Chapters 4 and 5 deal with the synthesized silk-inspired materials using a combination of aramids and low T_g polymers. The *p*-aramid/Kevlar block mimics the β -sheet structure and provides mechanical strength and crystallinity, while soft segments like polybutadiene and polybutylacrylate provide flexibility and low processing temperature.

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