On the Numerical and Experimental Investigation of Light-Matter Interactions in Polymers

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Abstract

The aim of this research project is to investigate the photo-mechanical response of polymers with embedded switching molecules. To this end we formulate a continuum modeling approach coupling the mechanical response to the behavior of the switching molecules and an electric field representing the incident light. This theoretical approach is accompanied by photo-mechanical experiments performed with the silicone Elastosil P7670 mixed with various different Azobenzene molecules provided by Prof. Wegner (Giessen University). We perform two different kinds of experiments on the photo-sensitive polymers to characterize the response. In order to obtain information on the macroscale we use uniaxial deformation experiments (multistep and cyclic loading) with or without UV illumination. On the other hand, we perform infrared-absorption spectroscopy experiements to investigate the material response on the molecular scale. Ultimately, the combination of both experiments will provide a detailed characterization of the material.

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