MECHANOCHEMICALLY INDUCED SWITCHING OF SPIROPYRANS

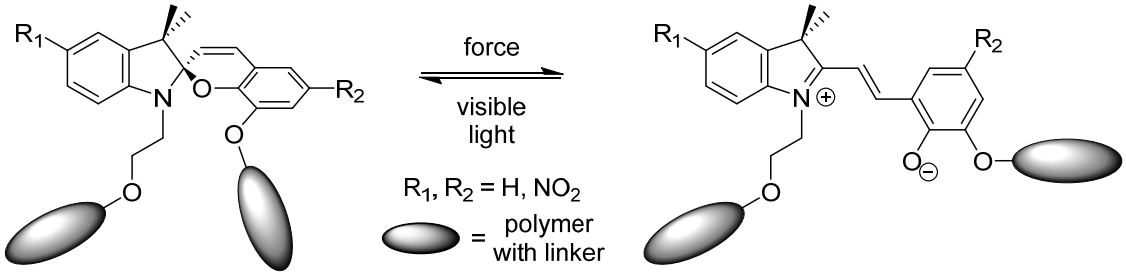
Jiří Tůma, Jessica Lee Barilone, and Martin Krupička

Department of Organic Chemistry, University of Chemistry and Technology Prague, Technická 5, 166 28 Prague, Czech Republic

Spiropyrans are molecular fragments commonly used for their unique photoswitching properties amongst others. Upon irradiation, spiropyran compounds tend to isomerize from their natural colourless form to strongly absorbing merocyanines and vice versa. This phenomenon is broadly utilized in various photoswitchable organic materials [1]. The activation energy of such isomerization can be significantly adjusted by adjacent substituents, even to the extent where it is photochemically unfeasible [2].

Recently, it has been found that the isomerization of spiropyrans is also possible using external mechanical force [3]. Herein we present synthesis and evaluation of a library of polymer-bound spiropyrans based on polyethyleneglycol (PEG), polydimethylsiloxane (PDMS), or polymethylmethacrylate (PMMA) (Scheme 1). The prepared polymeric materials were subjected to external mechanical stress (sonication). UV-VIS experiments have proven that such materials undergo the mechanically induced ring-opening process (isomerization) to the corresponding merocyanines. The backwards ring closing process is triggered upon irradiation with visible light. We have shown that mechanical force can be used as efficient method for spiropyran ring-opening even in cases, where the classic photochemical isomerization fails.

Scheme 1:



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