Thiosemicarbazone photoswitch for light-responsive transparent liquid crystal materials

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Photoswitches are promising molecules for creating light-responsive materials. However, many of the most widely studied photoswitches absorb light in the visible spectrum. [1] This can cause unwanted coloration and limit their use in transparent optical materials. We investigate a colourless thiosemicarbazone photoswitch, [2] with the aim of enabling visibly transparent photo responsive liquid crystal materials.

The thiosemicarbazone photoswitch is functionalised by introducing an acrylate end group. This addition allows for crosslinking into a liquid crystal network. Upon photoisomerization, the molecular shape change builds up stress in the surrounding network. Combined with liquid crystal alignment, this enables amplified macroscopic shape-changes in the material.

The resulting material can reversibly switch from the stable E-isomer to the Z-isomer upon UV irradiation. Both isomers remain transparent across the visible spectrum. Relaxation from the Z-isomer occurs thermally, with the network showcasing a thermal half-time of 80 minutes at room temperature. These results demonstrate the potential of transparent thiosemicarbazone photoswitches as building blocks for colourless light-responsive liquid crystal materials.

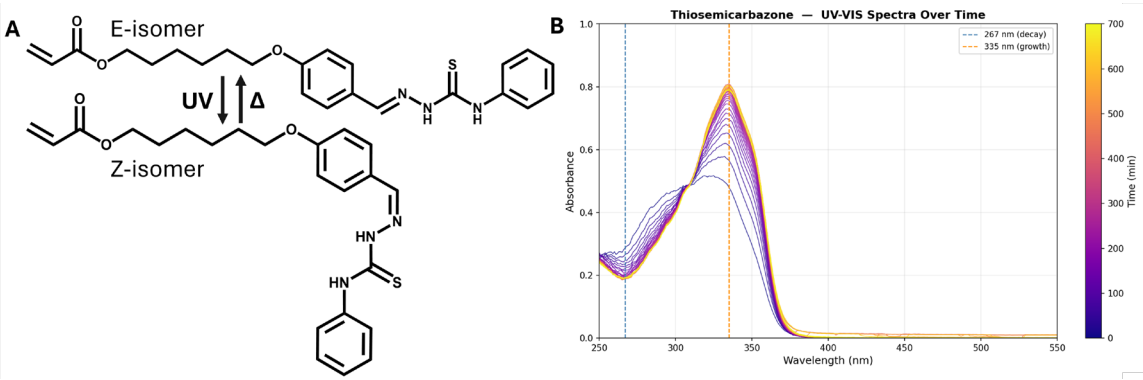

Figure 1. A) The thiosemicarbazone photoswitch in the E and Z isomer. B) The absorbance of thiosemicarbazone measured over time during thermal relaxation.

References

[1] M. Marcon, C. Haag, and B. König, "Photoswitches beyond azobenzene: a beginner's guide", *Beilstein Journal of Organic Chemistry* 21, 1808–1853, 2025.

[2] B. Sentürk, B. Butschke, and F. Eisenreich, "Thiosemicarbazones as versatile photoswitches with light-controllable supramolecular activity", *Chemical Science* 16, 3130–3140, 2025.