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Continuous Processing Approaches for Tunable Asymmetric Photochemical Synthesis

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Abstract : Enabling technologies such as continuous processing (CP) approaches can provide the tools needed to control and manipulate reactivities and transform chemical reactions into micro-controlled in-flow processes. Traditional synthetic approaches can be radically transformed by the application of CP, facilitating the pairing of chemical methodologies with technologies from other disciplines. CP supports sustainable processes that controllably generate reaction specificity utilizing supramolecular interactions. Continuous photochemical processing is an emerging field of investigation. The use of light to drive chemical reactivity is not novel, but the controlled use of specific and tunable wavelengths of light to selectively generate molecular structure under continuous processing conditions is an innovative approach towards chemical synthesis. This investigation focuses on the use of circularly polarized (cp) light as a sustainable catalyst for the CP generation of asymmetric molecules. Chiral photolysis has already been achieved under batch, solid-phase conditions: using synchrotron-sourced cp light, asymmetric photolytic selectivities of up to 4.2% enantiomeric excess (e.e.) have been reported. In order to determine the optimal wavelengths to use for irradiation with cp light for any given molecular building block, CD and anisotropy spectra for each building block of interest have been generated in two different solvents (water, hexafluoroisopropanol) across a range of wavelengths (130-400 nm). These spectra are being used to support a series of CP experiments using cp light to generate enantioselectivity.

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