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Abstract

Photocatalytic Oxygenation of Heterostilbenes in Microflow Reactors †

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Abstract: Photochemistry involves processes in which light, the principal reagent, and photocatalysts open pathways to diversifying photochemical products. Promising results are obtained in reactions where porphyrin complexes coordinated with certain metals are used as catalysts. The most common porphyrin complexes used in various organic reactions were manganese porphyrins. Nowadays, batch reactors used for photochemical reactions are commonly replaced with flow reactors. Microflow reactors are one of the reactor types, whose main characteristic is the micro-dimension of channels (max. diameter of 500 μm). Flow chemistry performed on a microscale brings improvements in many aspects of photochemical reactions, such as efficient and fast phase mixing and heat transfer, precise retention time control, homogeneous use of light irradiation throughout the reaction mixture, process safety, and potentially simple scale-up. In this research, anionic/cationic manganese(III) porphyrins were used as photocatalysts. The reactions were first performed in a batch reactor, where complete conversion of the substrate was observed after 2 h for furostilbene and 16 h for thienostilbene substrate. As a result, the formation of formyl, epoxy, carbonyl, or hydroxy derivatives was observed. A step forward in process development was made by replacing batch with microflow reactors. A total of four different tubular microflow reactors were studied and compared with results obtained in a batch reactor based on substrate conversion and reaction time. Reactions were significantly accelerated in the microflow reactors, where the complete substrate conversion for furostilbene substrate was observed in a residence time of 0.7 min and for thienostilbene substrate in 3.5 min.

Keywords: photocatalysis; microreactors; furostilbene; thienostilbene

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