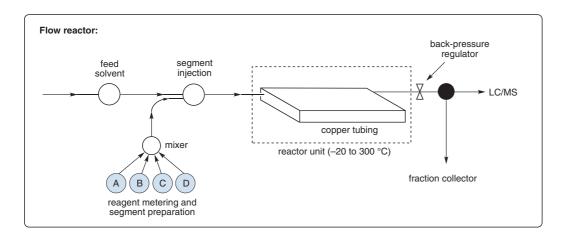
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Efficient Access to New Chemical Space through Flow—Construction of Druglike Macrocycles through Copper-Surface-Catalyzed Azide–Alkyne Cycloaddition Reactions

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Flow Macrocyclization Using Copper Tubing



Flow macrocyclization reaction:

Significance: Flow macrocyclization with a copper surface catalyst via the azide–acetylene cycloaddition reaction was described. The flow macrocyclization of an azidealkyne 1 with TTTA and DIPEA was performed in copper tubing (3 m length, 0.75 mm inner diameter) to give the triazole-containing macrocycle 2 in 73% isolated yield within five minutes of residence time without addition of extraneous copper(I) salt in the reaction mixture. The structure of the 12-memberd macrocycle 2 was confirmed by X-ray crystallography.

Comment: A series of 12- to 22-membered macrocycles was prepared under similar flow conditions (14 examples, 28–90% yield). Elemental analysis in the ethanolic reaction mixture indicated less than 5 ppm of copper. In flask reactions, refluxing the reaction mixture of azidealkyne 1, TTTA, and DIPEA in ethanol with copper turnings gave no detectable product 2 after five minutes, and only a trace amount of 2 after 90 min. Under similar conditions, Cul (0.2 or 1.0 equiv) was also not effective.

Category

Polymer-Supported Synthesis

Key words

flow chemistry macrocycles copper tubing click chemistry



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