SEPTEMBER 23-27 2024
19BMOS
BRAZILIAN MEETING ON ORGANIC SYNTHESIS
BENTO GONÇALVES, RS - BRAZIL

Telescoped Continuous Flow Photochemical and Electrochemical Synthesis of Butyrolactones

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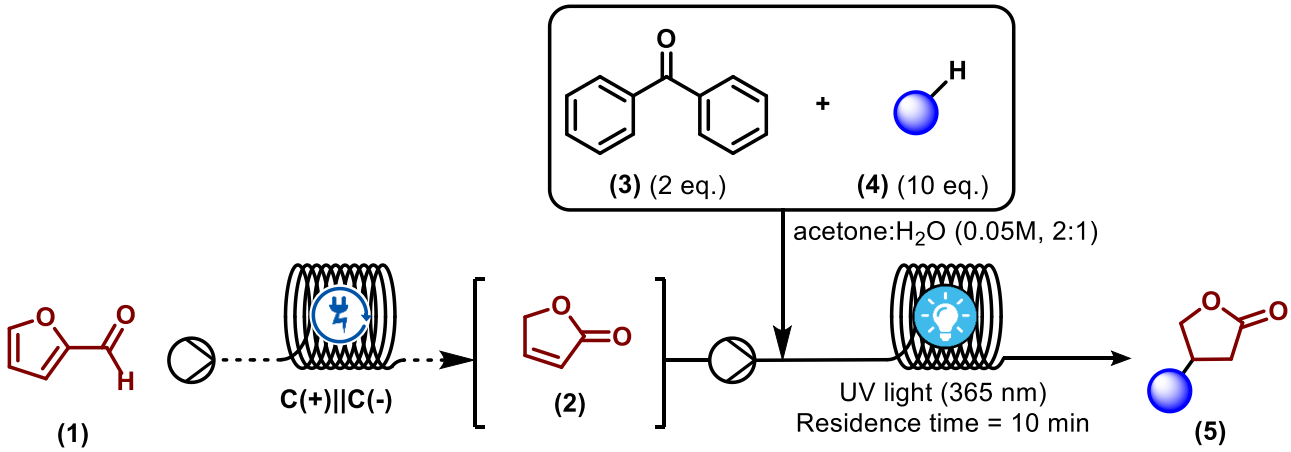
Keywords: *Photochemistry, Electrochemistry, Continuous Flow.*

ABSTRACT

The environmental impact resulting from the excessive use of fossil fuels has driven the advancement of more sustainable technologies and processes, in line with the recommendations of the United Nations (UN) as expressed in the Sustainable Development Goals (SDGs). Thus, there is a growing demand for innovative solutions that seek to valorize biomass and utilize sustainable energy sources such as light and electrical power. Herein, we describe the conversion of furfural (**1**), derived from the abundant biomass polymer hemicellulose, into bioactive butyrolactones (**5**) using integrated photochemical and electrochemical processes under continuous flow conditions. First, furfural is converted into (2H)-5-furanone (**2**) via anodic oxidation of water.[1,2] This is followed by a photochemical step, where the alkylation of (2H)-5-furanone (**2**) is mediated by benzophenone (**3**), enabling a hydrogen atom transfer (HAT) step on a selected H-donor group (**4**), resulting in the alkyl butyrolactone.[3] Under optimized conditions, (**5**) was obtained in 80% yield in the photochemical step using isopropanol as H-donor group (**4**).

The electrochemical step and the integration of the two steps in a telescoped process are now in progress and will be presented.



Scheme 1: Telescoped electrochemical and photochemical synthesis of alkyl butyrolactones (**5**).

ACKNOWLEDGEMENTS

The authors gratefully acknowledge financial support from the São Paulo Research Foundation – FAPESP (LGR, 2023/15576-7; RCS, 2023/07466-7; JCP, 2021/06661-5) and the Brazilian National Council for Scientific and Technological Development – CNPq (JCP, 308540/2021-2)

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