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Green Synthesis of Complex Chemical Building Blocks: Light-Mediated Oxygenation of Phenols

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Photooxygenations provide a sustainable access to functionalized organic molecules, using visible light as an abundant energy source for small molecule activation and molecular oxygen as a cheap oxidant. A dye operates as an energy mediator, exciting the triplet ground state of molecular oxygen into its singlet excited state which is not merely a highly reactive species but rather a selective oxidant.[1] The reactions of singlet oxygen with alkenes and phenols to yield hydroperoxides are
well established.[1,2] Our work focuses on the synthesis of quinol epoxides 3 from simple phenol 1 feedstocks using molecular oxygen as the sole stoichiometric reagent and a quinol peroxide 2 as key intermediate.

Inspired by previous reports,[3,4] we systematically screened reaction conditions to enable the conversion of electron-rich phenols 1 into three-dimensional, highly functionalized epoxy quinol building blocks 3. Mechanistic investigations provide deeper insights into the transformation and the structure of involved intermediates,
while product derivatizations highlight the synthetic value of these structures in complex molecule synthesis.

Author: BIMBERG, Ben (Department of Chemistry, University of Hamburg)

Presenter: BIMBERG, Ben (Department of Chemistry, University of Hamburg)

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