

Ferroelectric field enhanced tribocatalysis hydrogen production and RhB dye degradation by tungsten bronze ferroelectrics

Zhihong Zhu¹, Zuheng Jin¹, Chuan Jiang¹, Sha Wu¹, Changzheng Hu^{1,2*}, Lajun Liu^{1,2}, Liang Fang^{1,2},
Zhenxiang Cheng^{3*}

1. Key Laboratory of Nonferrous Metal Oxide Electronic Functional Materials and Devices,
Education Department of Guangxi, College of Materials Science and Engineering, Guilin University of
Technology, Guilin 541004, China

2. Collaborative Innovation Centre for Exploration of Nonferrous Metal Deposits and Efficient
Utilization of Resources in Guangxi, Guangxi Key Laboratory of Optical and Electronic Materials and
Devices, Guilin University of Technology, Guilin, 541004, China

3. Institute for Superconducting and Electronic Materials, University of Wollongong, Innovation
Campus, Squires Way, North Wollongong, NSW 2500, Australia

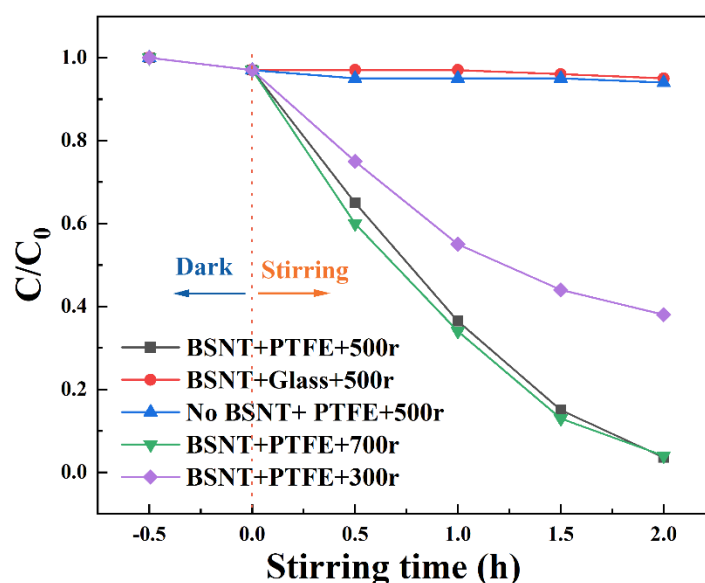


Figure S1 Comparative experiments on dye degradation

The Figure S1 demonstrates that the presence of a glass stirring bar did not result in any significant degradation of Rhodamine B (RhB), even when the catalyst was introduced and stirring was applied. Conversely, when no catalyst was added but a PTFE magnetic stirring bar was used, only a negligible amount of RhB degradation was observed. It was noted that an increase in stirring speed showed a positive correlation with the efficiency of degradation, while ensuring there were no

Corresponding author. Tel: 86-773-5896290; E-mail address: huchzh@foxmail.com (C.Z. Hu)

Corresponding author. Tel: 61-2-42981406; E-mail address: cheng@uow.edu.au (Z.X. Cheng)

instances of catalyst spattering.

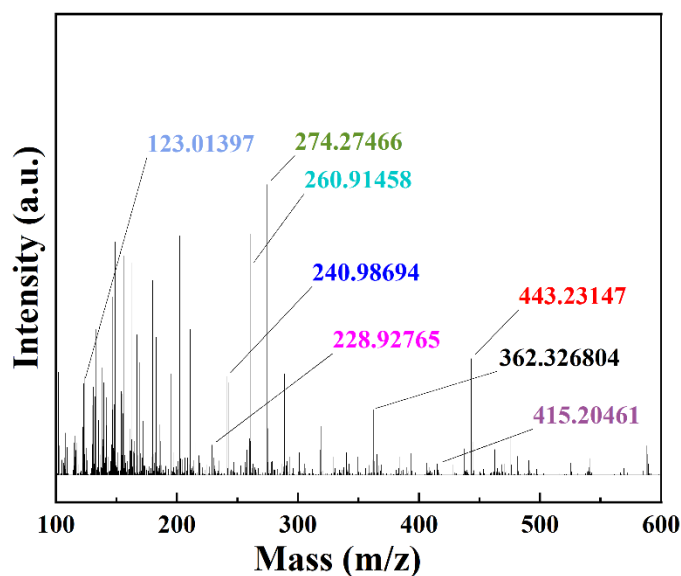


Figure S2 Mass Spectrometry Spectrum

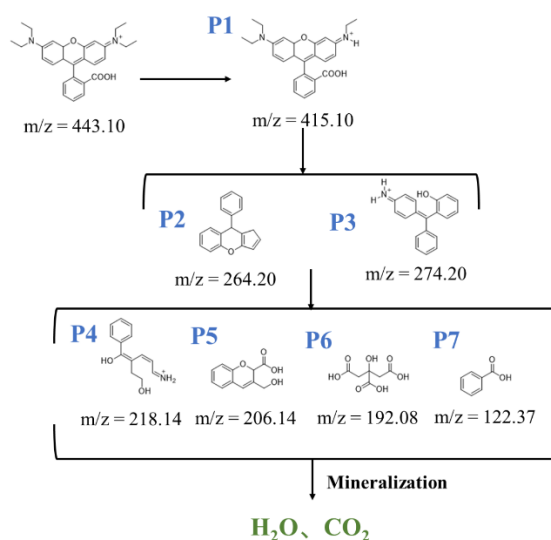


Figure S3 Possible degradation pathways for Rh B.

The intermediate present in the solution after a 2-hour reaction was analyzed using MS to deduce the potential degradation pathway. As depicted in Figure S2-3, Rhodamine B initially underwent ethyl group detachment to form intermediate P1. Subsequently, under the influence of holes and hydroxyl radicals, the conjugated structure within the dye molecule continuously opened up (P2~P3). With progression of the degradation reaction, certain aromatic organic compounds with relatively low molecular weights (P4, P5, P7) and linear organic compounds (P6) resulting from complete ring-opening emerged as intermediates. Ultimately, these intermediate products would undergo mineralization into H₂O and CO₂.