Back

Research Article

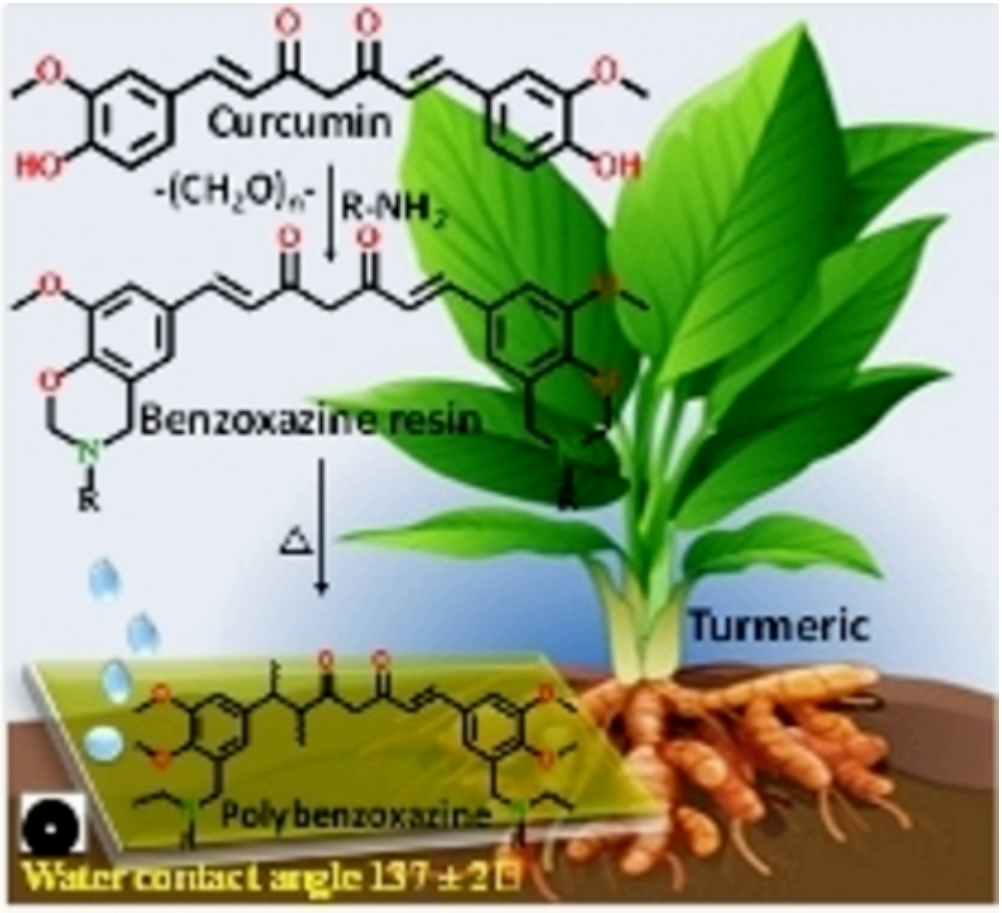
Synthesis and Characterization of Sustainable Curcumin-Based Bio-benzoxazines for Antimicrobial and Anticorrosion Applications

Narmatha Muthukumar, Dr. Hariharan Arumugam, Dr. Balaji Krishnasamy, Dr. Muthusamy Athianna, Prof. Alagar Muthukaruppan

First published: 26 March 2023
https://doi.org/10.1002/slct.202204302
Citations: 5

Graphical Abstract

Curcumin based bio-benzoxazines have been studies for hydrophobic, antimicrobial, anticorrosion properties.



Abstract

Back

furfurylamine (ffa) and octadecylamine (oda) under suitable experimental conditions. FTIR and ^{1}H-NMR spectra were used to confirm the molecular structure of synthesized curcumin based benzoxazine monomers (CU-a, CU-ffa and CU-oda). It was found that the curing temperatures of the three benzoxazine monomers, CU-a, CU-ffa, and CU-oda are 207 °C, 193 °C, and 199 °C respectively. According to theromogravimetric analysis (TGA) analysis, cured poly(CU-a), poly(CU-ffa), and poly(CU-oda) have remaining char yields of 78, 77, and 55 %, respectively, and their corresponding limiting oxygen index (LOI) values are 49, 48, and 40, respectively, confirming that they have exceptional thermal stability and flame-retardant qualities that are ideal for applications. The value of water contact angle of poly(CU-a), poly(CU-ffa) and poly(CU-oda) are 131°, 135° and 137° respectively, which infer their excellent hydrophobicity. Results from corrosion and anti-microbial studies ascertain that these curcumin based benzoxazines can be considered as efficient coating materials to protect the surfaces of mild steel specimen under adverse environmental conditions. Using density-functional theory (DFT) band gap of the monomers has been calculated and found that CU-a possesses the lower value of band gap of 2.9212 eV than other benzoxazines.

Conflict of interest

The authors declare no conflict of interest.

Open Research

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Supporting Information

As a service to our authors and readers, this journal provides supporting information supplied by the authors. Such materials are peer reviewed and may be re-organized for online delivery, but are not copy-edited or typeset. Technical support issues arising from supporting information (other than missing files) should be addressed to the authors.