
Development of Acrylated Bioresin from Soybean Oil using Green Solvents

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Soybean oil epoxidation is approached through chemical, enzymatic and chemoenzymatic route. The major challenge in chemical method is use of high amount of acids. Similarly in enzymatic method, there is a significant substrate inhibition which makes the process very slow, inefficient and expensive. To overcome this, Deep Eutectic Solvent (DES) were used in the epoxidation process. In total, 28 DESs were screened and potential DESs were identified for soybean oil epoxidation followed by optimization of the reaction condition. Use of DES resulted in reduction the use of acid significantly i.e. up to 50%, while ensuring for 83% yield of epoxy product. Acetylcholine chloride (AChCl): Oxalic acid, Choline Chloride: Butyric acid and Acetylcholine Chloride: butyric acid based DES was found promising in catalyzing soybean oil epoxidation with a yield value of more than 80%. This was also confirmed by FTIR spectroscopy, as evaluated by intensity at wave number 825 and 3008 cm^{-1} . This makes the process of epoxy resin development as greener and economic as compared to convention chemical or enzymatic method. Subsequently, acrylated epoxidized soybean oil based bioresin was developed following curing with acrylic acid. Differential Scanning Calorimetric study was performed to understand the thermal stability rheological properties were evaluated to assess the processability of the developed bioresin.