

## **A Novel Green Method to Synthesize Zeolites from the Bagasse Fly Ash (A Sugar Industry Waste) and Sorptive Removal of Methylene Blue**

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### **ABSTRACT**

Sugar industry is one of the most important agri-based industries in India. Majority of research on the beneficial use of Bagasse Fly Ash (BFA), a waste produced in sugar industries, has been focused on generation of cement or pavement, land filling, fillers in building materials and paper and wood boards, and recently as a sorbent. Our aim was to find ways to broaden the use of BFA, such as generation of zeolites that may be used as ion exchangers in remediating contaminated soils, water and wastewater, and sequestering gases such as CO<sub>2</sub> and SO<sub>2</sub>. To our knowledge, generation of zeolites from BFA has never been investigated. The main components of the BFA used in our study are silica and alumina, the same components that are the fundamental building blocks of zeolites. We developed a green approach of synthesizing zeolite (ZFA) from bagasse fly ash. The method appeared to perform quite well. Zeolite structure revealed by SEM images was verified by XRD patterns. Thermogravimetric analysis with simultaneous differential thermal analysis of zeolite carried out to evaluate the kinetic and thermodynamic data, such as energy of activation, pre exponential factor, entropy of activation, free energy of activation, and enthalpy of activation. The synthesized zeolite (ZFA) as well as the virgin BFA was applied for the removal of Methylene Blue (MB) from aqueous solution. The effect of various operating variables, viz, hydronium ion concentration, contact time, dye concentration, sorbent dose, and temperature were evaluated. The material exhibited good sorption capacity.