

Chapter 13

Effective Utilization of Industrial Wastes for Preparing Polymer Matrix Composites: Usage of Industrial Wastes

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ABSTRACT

The present industry scenario focuses on green manufacturing, in terms of effective reuse and recycling of the industrial wastes generated in enormous amount while preparing the product. The wastes also act as a threat to the society by causing various kinds of pollution. Therefore, the proper safe disposal of the same is a very critical factor. Most of the industries struggled with the enormous disposal of these wastes and finding ways for reuse and disposal. In this chapter, one such way of reuse of these wastes for making composite product is explored. Industrial wastes such as flyash and ricehusk used as fillers of varying weight percentages, 6%, 8%, 30%, 40%, and 50%, wt%, respectively, are reinforced with matrix. The prepared composites were subjected to flexural studies to know the load withstand ability. Results show that the incorporation of both fly ash and rice husk industrial wastes as filler into the polymer matrix increases the flexural strength. In addition, a low-cost product with high strength and good performance is obtained by adding this waste.

INTRODUCTION

With the growing needs and the development in technology more number of new products released from the industries to the society. At the same time the manufacturing process involved in preparing such products will be the vital discussion part. The major problem that the industry facing in today scenario is the disposal of the industrial wastes in such a manner that it will not affect the environment. Number of reuse and disposal methods are in practice in the industry, but still the need for much improved disposal of the same is the need for the hour. This chapter emphasis the reuse of two major industrial wastes such as Flyash and Ricehusk for making innovative composite materials. These two wastes are produced in enormous amount from the industry sectors as well as local sectors, for example the industry waste flyash generated not only in industry almost in all other sector where burning of some elements finally result in the flyash. On the other hand almost equivalent to flyash, ricehusk also generated in rapid amount due to the usage of food (rice) throughout the world. The industry is now looking for the potential reuse of these materials and one of the way suggested and discussed in detail is the preparation of composite materials using the same. The attractive features of the composite materials such as low cost, high strength and more resistance which make it suitable for various industrial applications replacing the conventional materials. Different type of composites are prepared by using two phases namely the reinforcement and the matrix phase. Enormous amount even out of any two different materials one we use as reinforcement phase and other use as matrix phase. The different types of matrices are metal, polymer and ceramic is the most commonly used for various composite preparations. The matrix will be chosen based on the better compatibility with the reinforcement for the same the polymer matrix selected for the industrial wastes fly ash and rice husk used as reinforcement.

BACKGROUND

The effective utilization of industrial wastes fly ash and rice husk as potential particle replacement for cement has been done by Satish et al. (2013) in which the compressive strength, flexural strength and tensile strength of the concretes made by mixing fly ash and rice husk in different weight proportions along with cement gives increase in strength. With fly ash as nano filler and micro filler, Al_2O_3 , TiO_2 used as reinforcement along with epoxy matrix. Further the mechanical properties studies has been analyzed and noted that the strength decreases with the increasing content of the micro fillers and nano fillers (Ozsoy et al., 2015). In addition to the fly ash filler Nithin Kumar et al. (2015) carried out studies on wood powder as filler on the polymer composites produces promising increase in the mechanical strength. The effect of rice husk silica filler reinforced with high density polyethylene has been studied by Midhun Dominic et al. (2014) in which the surface modification done by using hydrochloric acid and inferred that the mechanical properties of the same higher than that of the pure polymer. The problems related to the disposal of wastes such as fly ash, slags from energy mining and metallurgical industries can be solved by potentially utilizing the waste with geopolymers for producing new composites replacing the existing cementitious materials (Korniejenko et al., 2015).

Sahai and Neha Pawar (2014) performed studies on fly ash filled polyphenylene oxide composites by varying the weight percentages of fly ash using screw extruder machine. The prepared specimens were subjected to mechanical properties and rheological properties analyze and the results were reported. Flexural studies on addition of fly ash along with the geopolymers has been carried out and analyzed

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