National Institute of Technology Rourkela

Synopsis Seminar

Seminar Title	: Thermal, Mechanical and Tribological Characteristics of Waste Glass Dust Filled Epoxy Composites
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Venue	: Mechanical Engineering Dept Seminar Room (ME001)
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Abstract	: *This thesis essentially reports on the research dealing with the processing and characterization of waste glass dust filled epoxy composites and is broadly divided into four parts. The first part of the work includes the development of two theoretical correlations based on one dimensional heat conduction models for estimation of effective thermal conductivity of polymer composites first with only waste glass dust as filler and then of hybrid composites reinforced with both filler and hemp/flax as reinforcements. The second part depicts the details of the test procedures and test results in regard to the physical, mechanical, thermal and micro-structural characteristics of all the epoxy composites filled with waste glass dust. The third part depicts the estimation of effective thermal conductivity of the composites numerically using finite element method (FEM). In this part, the thermal characteristics of the composites with different filler concentrations are discussed and the results are validated by corresponding experimental and analytical results. In the last part, the tribological properties of the hybrid composites are evaluated.*

The effects of inclusion of glass dust and/or natural fibers on the effective thermal conductivity (k_{eff}), glass transition temperature (T_g) and coefficient of thermal expansion (CTE) of epoxy composites are studied. This work shows that the FEM serves as a very good predictive tool for assessment of thermal conductivity of composites. The proposed theoretical correlations too can serve as very good empirical models to estimate k_{eff} for spherical filler composites with and without fibers. With the addition of WGD, the thermal conductivity and CTE values decrease. Whereas, the embedment of both WGD and fibers results in substantial improvement in the T_g of the composites.

With light weight, improved insulation capability, improved glass transition temperature and reduced coefficient of thermal expansion, the waste glass dust and natural fiber reinforced hybrid epoxy composites can be used for applications such as insulation boards, food containers, thermos-flasks, building materials, space flight, aviation industry, micro-electronics applications like electronic packaging, encapsulations, printed circuit board substrates etc.