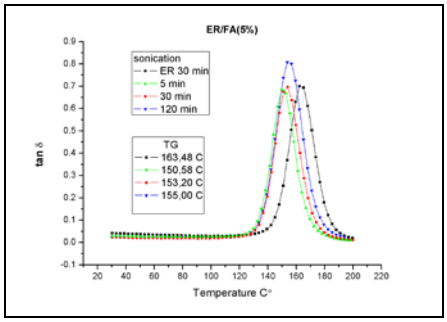
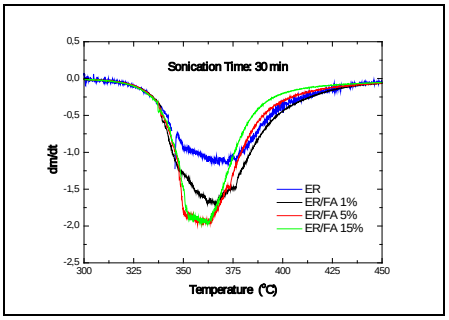
XXXII Panhellenic Conference on Solid State Physics and Materials Science
Conference Center "Carolos Papoulias", 18-21 September 2016, Ioannina, Greece

Thermodynamic characterization and behavior of epoxy / fly ash composites

A. Stimoniaris[1,4], H. Zois[2], A. Kanapitsas[3], C. Delides[1]
[1]*Department of Environmental Engineering and Pollution Control, Technological Educational Institute of West Macedonia, Kila, GR–50100, Kozani, Greece*
[2]*Merchant Marine Academy of Epirus, Vathi, GR–48100, Preveza, Greece*
[3]*Depapartment of Electronic Engineering, Technological Educational Institute of Sterea Ellada, GR–35100, Lamia, Greece*
[4]*Department of Materials Science and Engineering, University of Ioannina, GR–45110, Ioannina, Greece*

Abstract: The Fly ash (FA) is a waste by-product rich in oxides such as SiO2, Al2O3 and Fe2O3, which has proved to have some favourable functions as filler in polymer composites [1, 2]. In this work, we have prepared epoxy resin (ER) composites filled with fly ash. The fly ash was produced at the power stations of Kozanis region in northern Greece and it is rich in CaO due to the origin of the burned lignite. An epoxy system (DGEBA) was used as matrix along with a triethilentetramine (TETA) curing agent. Optical and Scanning electron microscopy (SEM) was used to clarify the dispersion and the degree of aggregation/agglomeration of fly ash particulates in the matrix. In addition, DMA, DSC and TGA measurements are also employed to characterize dynamic mechanical properties, crystallinity and the heat-resistant performance of the composites. It was concluded that the mechanical stirring and ultrasonication was a useful combination to prepare highly dispersed fly ash composites. Interesting results concerning the effect of filler content and the sonication time on the dispersion and the deaggregation/deagglomeration of fly ash and on the thermomechanical properties of the composites were derived. Two DMA and TGA characteristic diagrams are shown below.





References

[1] Ahmad, A. Mahanwam, J. Miner. Mater. Charact. Eng. 9, 183-198 (2010).
[2] R.S. Raja, et al. Int. J. Min. Met. Mech. Eng. 1, 34 (2013).