Experimental Investigation on the Thermal Conductivity Measurement of the Fly Ash Dispersed Plastic Composite Using Guarded Hot Plate Apparatus

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PWFA (Plastic Waste / Fly Ash) composite, which is made mostly from plastic waste and fly ash, is one of the materials developed for the purpose of recycling. The irregular plastic in shape and size, different plastics and plastics unsuitable for recycle with an existing technology can be mixed in the ingredient of the composite. Most of the recovered plastic wastes were the polypropylene and polyethylene resins used for the home wrapping materials. Fly ash was generated at the domestic coal-fired power plant. A small amount of glass fiber as reinforcement and a fire retardant was added in the ingredient of the composite. The fundamental data about the thermophysical properties and structure of the composite is required for discussing the heat transfer in the composite and creating the different proportion of the composite material.

The authors observed the cutting surface of the composite using a metalloscope and measured the thermal conductivity of the composite using two guarded hot plate apparatus[1-3] suitable for the different sizes of specimen 100×100 and 50×50 mm^2 in area. It was found that the spherical particles of fly ash dispersed at irregular intervals in the matrix. The matrix composed of the plastic waste and the fire retardant was the continuous phase. And there is a dense area of air cavities inside the specimen.

The thermal conductivity data for the specimen 100×100 mm^2 decreased with increasing the specimen temperature. But the data for the specimen 50×50 mm^2 were approximately 2 % lower than those for the specimen 100×100 mm^2.

The present paper describes the feature of the composite, the observations of the distributions of fly ash and matrix, and the thermal conductivity data and its accuracy. We discuss the cause of the difference in thermal conductivity value between the specimen 100×100 and 50×50 mm^2.

[1] International Organization for Standardization, ISO 8302 *Thermal insulation–Determination of steady-state thermal resistance and related properties – Guarded hot plate apparatus*, (Geneva in Switzerland, International Organization for Standardization, 1991).
[2] J. Fujino, T. Honda, H. Yamashita, *Heat Transfer – Japanese Research*, **26**, 435 – 448 (1997).
[3] J. Fujino, T. Honda, Effect of specimen size on the thermal conductivity measurement using guarded hot plate apparatus, in Proceedings of the *16th European Conference on Thermophysical Properties*, (London in England, 2002) on CD-ROM.