Title

REGENERATION OF THERMALLY RECYCLED GLASS FIBRE FOR COST-EFFECTIVE COMPOSITE RECYCLING: IMPROVING THEMAL RECOVERY OF FIBRES FROM GRP

Abstract text

The processing and reuse of end-of-life composite products in an environmentally friendly manner is one of the most important challenges facing the industry and community. The development of an economically viable process for regenerating the properties of thermally recycled glass fibres would have major technological, societal, economic, environmental impacts. The ultimate goal of this project is to enable cost-effective regeneration of the mechanical properties of glass fibres which have been produced from thermal recycling of end-of-life glass reinforced structural composites from automotive and wind energy applications. The global annual production of glass reinforced composite materials is rapidly approaching 10 million tons, of which approximately 60% is thermoset based. A breakthrough in the regeneration of recycled glass fibre performance has the potential to totally transform the economics of recycling such GRP composites which would otherwise most likely be disposed of to landfill. This will enable such recycled fibres to compete with, and replace, pristine materials in many large volume composite applications. The reuse of these materials could result in a huge reduction in the environmental impact of the glass-fibre composites supply industry.

A number of processes are available for recycling such GRP composites. Of these possible routes, thermal recycling is probably the most technologically advanced. However, nearly all options deliver recycled fibres which suffer from a lack of cost competitiveness with pristine first-pass materials. A key issue, as far as the value of reuse of these glass fibres in reinforced composite applications is concerned, is the extreme loss of fibre tensile strength. This strength loss has been shown to be a closely correlated with the time-temperature thermal history of the fibres. Interestingly, it has recently been reported that thermal recovery of glass fibres from GRP can be assisted by the use of thermally activated semiconductors.

In this paper we report the results of a study of the influence of such thermally activated semiconductors on the properties of glass fibres recovered from GRP composites. Model glass fibre reinforced epoxy composites have been prepared. The degradation of these composites, with and without added thermally activated semiconductor, were studied at different processing temperatures using thermal gravimetric analysis (TGA). The properties of the glass fibres thermally recovered from these composites were characterised using single fibre tensile testing and scanning electronic microscopy (SEM). The results of these investigations will be presented and discussed in terms of their possible application in an improved recycling process for GRP composites.

Keywords

RECYCLING, GLASS FIBRES, COST-EFFECTIVE, MECHANICAL PROPERTIES, END-OF-LIFE

Authors **5**

RAGHAVALU THIRUMALAI, DURAI PRABHAKARAN (UNIVERSITY OF STRATHCLYDE, // DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING)

THOMASON, THOMASON, (UNIVERSITY OF STRATHCLYDE, // DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING)

YANG,, YANG, (UNIVERSITY OF STRATHCLYDE, // DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING)

KAO, KAO (UNIVERSITY OF STRATHCLYDE, // DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING)

JENKINS, JENKINS (UNIVERSITY OF STRATHCLYDE, // DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING)