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OBTAINING ELASTOMERIC COMPOSITES USING PLASTIC WASTE FROM ELECTRIC AND ELECTRONIC EQUIPMENT

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Introduction

A rapid use of natural resources has been greatly solicitated by population growth and urbanization. For this, materials recycling is crucial as long-term solution that could turn waste into a primary resource for industrial output in the future. Reducing the quantity of plastic waste, burned or landfilled, can help the planet regenerate. The best strategy to diminish the negative effects on the environment and health issues is to recycle and reuse plastics.

Considering the use of block-copolymers as shoe-sole materials, the aim of the study was to recycle the polystyrene part of dismantled electric and electronic equipment (WEEE) and non-metallic fraction of waste printed circuit boards (WPCB) as fillers for SBS elastomers.

Materials and methods

Equal proportion between waste plastics from WEEE and the non-metallic fraction of WPCB was used into styrene-butadiene block-copolymer' composites and their effect on the physical-mechanical properties of elastomer was studied, in comparison with the requirements regarding the characteristics of composites used for obtaining shoe soles directly injected on the footwear faces. Some of the composites were expanded by 25% paraffin-naphthenic oil, "white heavy oil" in order to increase the processability of the new materials. Composites with good homogeneity were obtained by solution casting method.

Results and conclusions

The research aimed to obtain technical materials based on SBS and waste polymers from electric and electronic equipment for shoe industry.

To create technical materials, proper inclusion of WEEE and WPCB, added in various ratios into SBS matrix, with or without oil extender, was followed.

The oil-extended composites showed oil drops diffused throughout the compact polymeric matrix as well as a degree of compatibility between the SBS polystyrene blocks and WEEE polymers with high molecular masses. Glass fibers and inorganic fillers dispersed into the elastomer were observed, with a slightly tendency to agglomerate at higher dosages of waste.

The presence of the individual components was emphasized by FTIR analysis. The change in intensity and shifted position of the specific absorbance peaks are obtained due to a certain compatibility between the polystyrene blocks of SBS with WEEE polymers and between polybutadiene blocks and WPCB.
The affinity between component polymers reflects into the composites' tensile properties. The strength and elongation are influenced by the waste proportion.
Also, the thermal characteristics of elastomeric composites and the dynamic-mechanical properties are changed by filler addition and plasticization.
Considering the results, it can be concluded that technical composites based on plasticized SBS and different proportion of WEEE/WPCB waste blend can be obtained.

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