Application of Flame Retardant Treated Halloysite Nanotubes in Foam and Plastic Polymers

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Flame retardants (FRs) are widely used in industrial and household products. Unfortunately, toxic additive flame retardants can be released into the environment and persist in wildlife and household dust. These chemicals have been linked to thyroid cancer and other disorders. In our previous study, an environmentally friendly method for preventing the release of flame retardants into the environment was developed. Halloysite nanotubes (HNTs), a naturally forming alumino-silicate clay with a hollow tubular shape, were used to immobilize flame retardants, preventing their release into the environment. This research has wide applications, as HNTs loaded with flame retardants can be used in huge variety of polymers and products as a safe flame retardant alternative. Therefore, we examined the practical application of the HNTs treated with FRs by applying them to rigid polyurethane (PU) foam and a thermoplastic elastomer-polybutylene terephthalate (TPE/PBT) plastic composite. Numerous thermal and mechanical tests were performed on the polymers. The results show an improvement in the flame retardant properties of the foam and plastic. Tensile strength substantially increased with the addition of the HNTs treated with FRs. Additionally, the physical structures of the PU foam became more uniform because the HNTs tended to agglomerate around the foam cells. This research has significance for both consumers and manufacturers. It prevents consumers from being exposed to toxic flame retardants, while also improving the quality of polymer products created by manufacturers. Furthermore, it provides a safer flame retardant alternative to protect the environment.

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