EXECUTIVE SUMMARY

Facile Classification of Polyurethane Foam from Post-Consumer-Use Mattresses

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To identify potential alternative uses for post-consumer mattress foam beyond carpet re-bond applications, a better understanding of the nature of the recovered foam is desired. This study provides insight into the composition and variability of post-consumer mattress foam. While a variety of methods were used to characterize the foam, one key finding was that a simple physical test can reliably categorize the foam as either conventional or memory foam.

Specifically, the team analyzed 110 samples from 60 post-consumer use mattresses and found that the rebound resilience of the foam layers correlated strongly with their chemical composition and physical properties as measured by spectroscopic and mechanical techniques. Thus, a low-cost, field-implementable technique – rebound resilience – can be used to classify post-consumer-mattress foams. This is important, particularly in cases where chemical recycling is being considered since the chemical composition of the two foam types differs significantly.

To better understand the levels of residual trace chemicals present in post-consumer foams, six representative samples were analyzed for the presence of tin, bismuth, chlorine, fluorine, bromine and PFAS. Tin was found at levels ranging from single digits to hundreds of ppm, while chlorine was found to range from ~100 hundred to a few thousand ppm. These elements are likely due to catalysts and flame retardants present in the foam formulation, respectively. The levels of bismuth, bromine, and fluorine ranged from not detected to below 10 ppm. PFAS were not detected in any of the samples evaluated to 10 ppt.

Additionally, seven representative samples were analyzed for the presence of bacteria and mold. These samples were cultured, and all showed the potential to proliferate into bacteria and mold colonies. Although

one cannot draw general conclusions based on this limited number of samples, this is likely due to prolonged exposure to dampness and moisture at temperatures conducive to microbial growth.

The results of this study can help to enable the development of recycling strategies tailored to different foam types and provide preliminary information on the nature and level of trace elements that may be found in post-consumer foam.

The full report can be found here.