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Compressive behavior of aluminum microfibers reinforced semi-rigid polyurethane foams (Article) (Open Access)

Linul, E.^a, Vălean, C.^a, Linul, P.-A.^{b,c}

^aDepartment of Mechanics and Strength of Materials, Politehnica University of Timisoara, 1 Mihai Viteazu Avenue, Timisoara, 300222, Romania
^bFaculty of Industrial Chemistry and Environmental Engineering, Politehnica University of Timisoara, 6 Vasile Parvan Avenue, Timisoara, 300223, Romania
^cNational Institute of Research for Electrochemistry and Condensed Matter, Aurel Paunescu Podeanu Street 144, Timisoara, 300569, Romania

Abstract

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Unreinforced and reinforced semi-rigid polyurethane (PU) foams were prepared and their compressive behavior was investigated. Aluminum microfibers (AMs) were added to the formulations to investigate their effect on mechanical properties and crush performances of closed-cell semi-rigid PU foams. Physical and mechanical properties of foams, including foam density, quasi-elastic gradient, compressive strength, densification strain, and energy absorption capability, were determined. The quasi-static compression tests were carried out at room temperature on cubic samples with a loading speed of 10 mm/min. Experimental results showed that the elastic properties and compressive strengths of reinforced semi-rigid PU foams were increased by addition of AMs into the foams. This increase in properties (61.81%-compressive strength and 71.29%-energy absorption) was obtained by adding up to 1.5% (of the foam liquid mass) aluminum microfibers. Above this upper limit of 1.5% AMs (e.g., 2% AMs), the compressive behavior changes and the energy absorption increases only by 12.68%; while the strength properties decreases by about 14.58% compared to unreinforced semi-rigid PU foam. The energy absorption performances of AMs reinforced semi-rigid PU foams were also found to be dependent on the percentage of microfiber in the same manner as the elastic and strength properties. © 2018 by the authors.

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Linul, E.; Department of Mechanics and Strength of Materials, Politehnica University of Timisoara, 1 Mihai Viteazu Avenue, Timisoara, Romania; email:emanoil.linul@upt.ro
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