

# HIGH DENSITY POLYETHYLENE MATRIX SYNTACTIC FOAMS: INDUSTRIAL SCALE FABRICATION AND MECHANICAL PROPERTIES

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Thermoplastic resins are widely used in consumer goods and structural components. Use of syntactic foams to replace some of the existing parts can help in saving weight in these structures and also help in reducing the consumption of thermoplastic resins. The present work describes development of high density (HDPE) matrix syntactic foams having fly ash cenosphere fillers using an industrial scale injection molding machine. Process optimization is conducted to minimize the microballoon fracture during processing. The fabricated syntactic foams are characterized for particle breakage, mechanical properties and thermal properties. The results show that the optimized process is capable of producing high quality syntactic foams. The tensile, quasi-static and high strain rate compressive and dynamic mechanical properties of the fabricated syntactic foams are presented. Theoretical models are used to predict the properties and these models are validated with the experimental results. The presentation also describes a new calculation method that can be used to extract modulus of resin and syntactic foams over a wide range of strain rates (Fig. 1) from testing of only one specimen on dynamic mechanical analyzer. This method can significantly reduce the experimental testing requirements to obtain the characteristic behavior of the material.

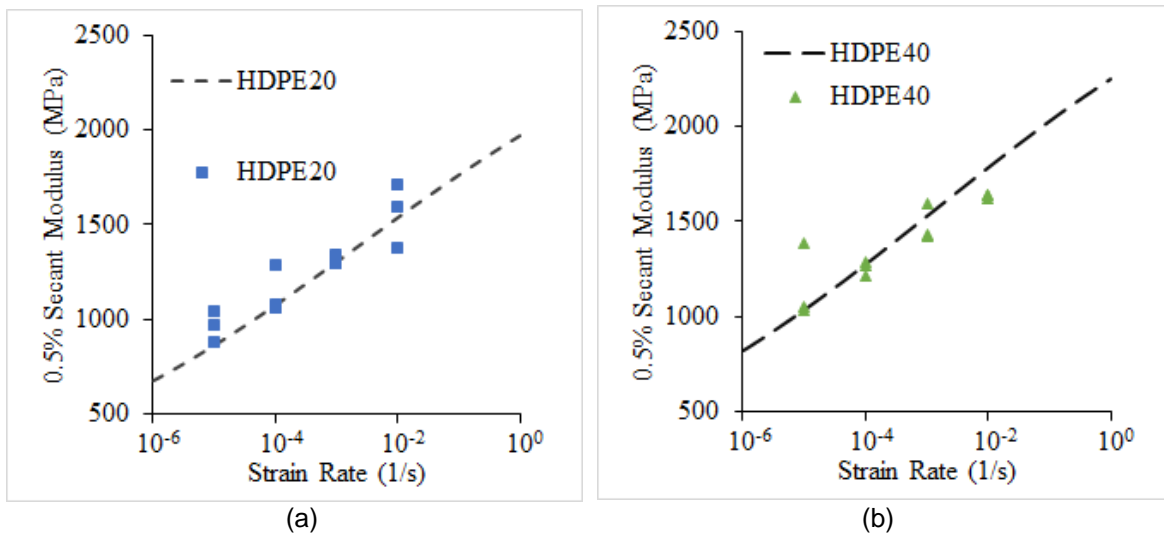


Fig. 1. HDPE matrix syntactic foams containing (a) 20 and (b) 40 wt.% particles. The experimental results obtained from tensile testing are presented as data points. The line represents result of calculation obtained from dynamic mechanical analysis.