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Effect of uncoated and coated diamond on the compressive properties of porous aluminium composites: Auswirkung von unbeschichtetem und beschichtetem Diamant auf die Druckeigenschaften von porösen Aluminiumverbundwerkstoffen

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Abstract
Porous aluminium composites are structural and functional materials that have vast potential, due to their lightweight and high energy absorption capacity, especially in automotive and aerospace applications. In this study, the effect of varying content of uncoated and titanium coated diamond particles on the compressive properties of porous aluminium composite was investigated. The composites were developed using powder metallurgy technique and porosity was attained by using polymethylmethacrylate (30 wt.%) as space holder material. The morphology of the pores was found to replicate the shape and size of polymethylmethacrylate particles, that were uniformly distributed in the composites. X-ray diffraction analysis confirmed formation of aluminium carbide in uncoated diamond-based aluminium composites while negligible amount was present in titanium coated porous composites during sintering. The porosities of composites decreased with an increase in diamond content due to the incomplete decomposition of polymethylmethacrylate particles. Moreover, the maximum plateau stress and energy absorption capacity of 9.96 MPa and 1.7 Mj/m3 were obtained for the composites with 8 wt.% of titanium coated diamond particles. Thus, coating inhibits the formation of undesirable compounds and contributes to better interfacial bonding between matrix and reinforcement. © 2023 Wiley-VCH GmbH.

Author Keywords
diamond; polymethylmethacrylate; porous aluminium; powder metallurgy; wettability

Index Keywords
Aluminum compounds, Coated materials, Particle size analysis, Polyesters, Porosity, Powder metallurgy, Sintering, X ray powder diffraction; Aluminum composites, Automotives, Coated diamond particles, Coated diamonds, Compressive properties, Energy absorption capacity, High-energy absorption, Polymethylmethacrylate, Porous aluminum, Titania; Diamonds

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