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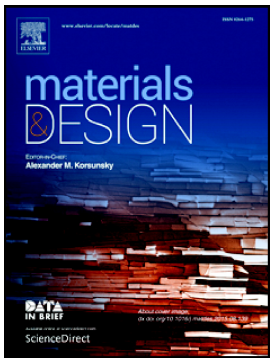

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Evaluating sputter deposited metal coatings on 3D printed polymer micro-truss structures

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Abstract

As the capabilities of additive manufacturing (AM) further advance, researchers can design materials and structures without traditional constraints on manufacturability, such as implementing structural features on the order of nanometers. While polymer AM is most mature, especially for producing features on smaller length scales, complex metal structures are also desirable because they provide enhanced strength, conductivity, and electrochemical properties. Here we explore a method to produce metal-polymer lattices by coating epoxy-based micro-trusses via magnetron sputtering. Unlike other deposition methods that are limited to single elements and a few alloys, sputtering enables the use of various metals and alloys such as Aluminum, Inconel 600, and Ti 6Al-4V, which were used in this study. Two sputtering configurations were applied: a stationary and a rotating substrate holder. Microtome sectioning was used to evaluate the cross-section of individual struts to measure coating thicknesses. Compression of the coated structures reveal the range of achievable mechanical properties when different metal coatings are used. Overall, the work here demonstrates that sputtering can be leveraged to impart favorable metallic properties on polymer microlattices with coatings in