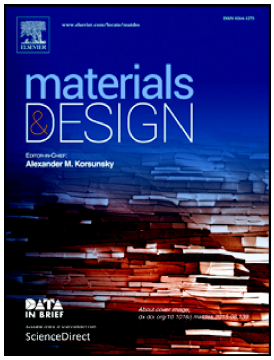

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Defect-free TiC/Si multi-layer electrical discharge coatings

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Abstract

The process of electrical discharge coating (EDC) may be used to deposit hard materials on conformal substrate surfaces. Next generation EDM'd components may exploit attachment phenomena to enhance recast layer properties, to avoid the need for recast layer removal. Here, a ceramic based composite layer was developed without cracking and porosity for the first time, using sequential coating using sacrificial TiC and Si electrodes. Attenuation of the discharge process by gap widening using Si debris in the gap explained improved layer properties. Composite coatings combining WC and TiC were also demonstrated, with good elemental intermixing. Attachment level was correlated strongly with melting point, with high melting point materials resisting ejection due to more rapid solidification. Nanoindentation showed the TiC and WC/TiC layers possessed the highest mean hardness