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Performance analysis and comparative assessment of nano-composite TiAlSiN/TiSiN/TiAlN coating in hard turning of AISI 52100 steel



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**Performance analysis and comparative assessment of nano-composite
TiAlSiN/TiSiN/TiAlN coating in hard turning of AISI 52100 steel**

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Abstract:

The present study investigates the machining performance of coatings deposited by cathode arc evaporation (CAE) and DC reactive magnetron sputtering (DCRMS) process with different structures and deposition layers on Al₂O₃/TiCN ceramic inserts in turning of hardened steel under dry cutting environment. Mono-layered AlCrN and multi-layered AlTiN were deposited using CAE process whereas nano-structured TiAlSiN/TiSiN/TiAlN coating was deposited using DCRMS process. The coated tools resulted in improved machining performance when compared to uncoated cutting tool. The CAE process resulted in surface defects like droplets and pores whereas the sputtering process generated droplet free surface that helped in superior performance of TiAlSiN/TiSiN/TiAlN coating when compared with AlTiN and AlCrN coatings. Moreover, nanostructure in TiAlSiN/TiSiN/TiAlN coating prevented coating flaking or peeling and ensured superior anti-abrasive behaviour due to its amorphous structure.

Keywords: *nano-composite coating; composite ceramic tool; hard machining; PVD coating; reactive magnetron sputtering*

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