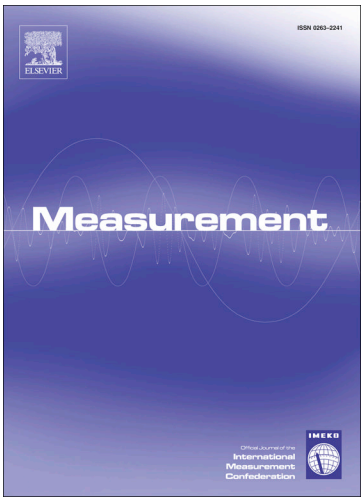

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The Characteristics of CVD- and PVD-Coated Carbide Tools in Hard Turning of AISI 4340

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Abstract: The present work is a contribution for improved productivity in cutting of hardened steel by utilizing coated carbide tools. Productivity was characterized by material removal rate (MRR) and volume of material removal (VMR), and a unique strategy had been developed to define them. Multilayer CVD- ($TiN/Al_2O_3/TiCN$) and monolayer PVD-coated carbide (TiCN) were studied in turning of AISI 4340 (48 ± 1 HRC). The results show that both are potential with reliable tool life (T) ranging from (8.1 – 27.5) minutes for multilayer CVD and (4.8 – 40.3) minutes for monolayer PVD at VB 0.2 mm. Surface finish which measured in Ra parameter are recorded at ($0.8 < Ra < 3.2$) microns. The average cutting temperature measured at the cutting area was ranging from (150 – 380) ^oC. The tough cutting edge of multilayer CVD ensures this carbide has higher productivity. Therefore, as far as rapid material removal is concerned, multilayer CVD is preferred. Lower values of MRR and Ra but longer value of T resulted by monolayer PVD indicate that this tool is more suitable for finishing. Lower cutting temperature of monolayer PVD indicates that low thermal conductivity of TiCN layer is successfully acting as a thermal barrier and thus, longer T is resulted. Besides, the higher hardness and the lower friction coefficient of TiCN to TiN contribute lower value of Ra for surface finish.

Keywords: flank wear, multilayer, monolayer, productivity, surface finish, MRR, VMR.