Influence of CoW_2B_2 and CoWB ternary phases on adherence of CVD diamond films on WC-TiC-Co substrates

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Tools coated with CVD diamond films are generally made of cemented carbide (WC- TiC-Co), Si_3N_4 [1] and molybdenum (Mo) [2]. The cemented carbides are mostly used, but Co presence hinders diamond growth. The boronising technique [3] forms an intermediate barrier that blocks Co diffusion to surface, minimising the Co binder negative effects for diamond growth. Before diamond films deposition, the WC-TiC-Co substrates have been submitted to a boronizing thermal diffusion treatment with different powder concentrations (B_4C, SiC, KBF_4, graphite). After reactive heat treatment samples were characterized by Scanning Electron Microscopy (SEM) and Energy Dispersive X-ray (EDX) for qualitative analysis of films grown. X-ray Diffraction (XRD) was used for quantitative analysis of phases formed in the boronizing process. In this work we have shown that for powder concentrations up to 20% of B_4C, there is the prevalence of CoW_2B_2 (Fig.1) ternary phase even after diamond film deposition. Other phases, as the CoWB, disappear after diamond growth. The results of diamond deposition (shown in Fig.2) strongly suggest a good adhesion between the film and the substrate.

Keywords: Diamond films, boronizing, cutting tools, HFCVD.

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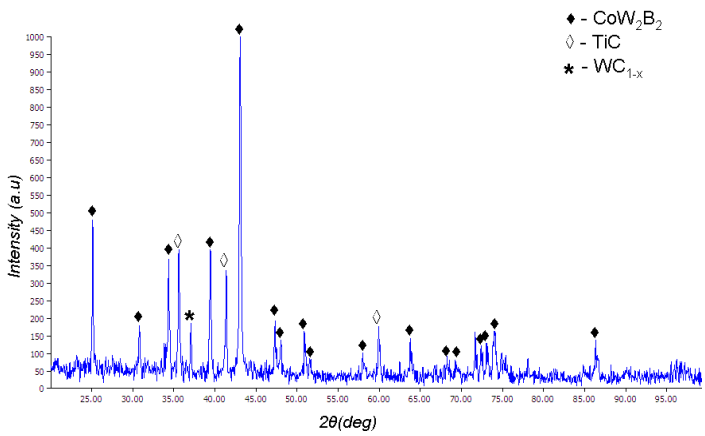

Fig. 1. X-ray diffractogram of WC-TiC-Co sample after boronising.

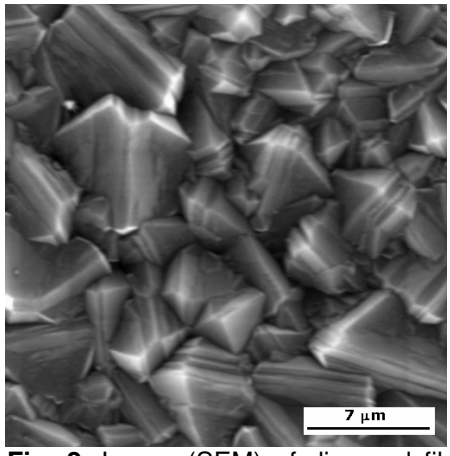

Fig. 2. Image (SEM) of diamond film deposited on WC-TiC-Co boronised surface.

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