

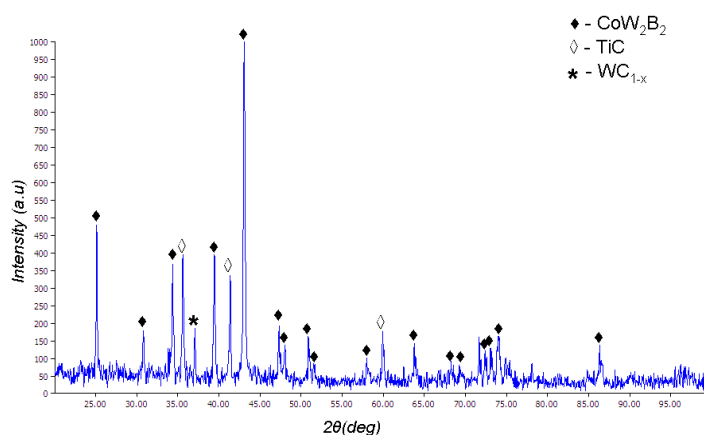
# Influence of $\text{CoW}_2\text{B}_2$ and $\text{CoWB}$ ternary phases on adherence of CVD diamond films on WC-TiC-Co substrates

A. Contin<sup>1</sup>, R. A. Campos<sup>1</sup>, D. M. Barquete<sup>2</sup>, V. J. Trava-Airoldi<sup>1</sup>, E. J. Corat<sup>1</sup>  
<sup>1</sup>*Instituto Nacional de Pesquisas Espaciais, São José dos Campos, SP, Brazil*  
<sup>2</sup>*Universidade Estadual de Santa Cruz, Ilhéus, BA, Brazil*

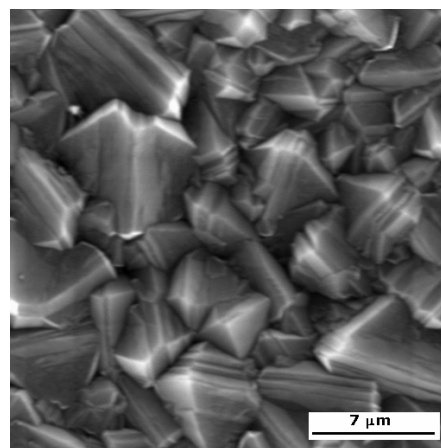
Tools coated with CVD diamond films are generally made of cemented carbide (WC- TiC-Co),  $\text{Si}_3\text{N}_4$  [1] and molybdenum (Mo) [2]. The cemented carbides are mostly used, but Co presence hinders diamond growth. The boronising technique [3] forms an intermediate barrier that blocks Co diffusion 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 ( $\text{B}_4\text{C}$ , SiC,  $\text{KBF}_4$ , 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  $\text{B}_4\text{C}$ , there is the prevalence of  $\text{CoW}_2\text{B}_2$  (Fig.1) ternary phase even after diamond film deposition. Other phases, as the  $\text{CoWB}$ , 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.

Work supported by CAPES and FAPESP.



**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.

[1] G. Cabral, J. Gäbler, J. Lindner, J. Grácio, R. Polini. *Diam Relat Mater.* **17**, 1008-1014 (2008).

[2] H Sein, W. Ahmed, C. Rego. *Diam Relat Mater.* **11**, 731-735 (2002)

[3] Qiang, W.; Qing, Z.; Wang, S. G.; Yoon, S. F.; Ahn, J.; Biaoqin Z.; Tang, W. Z.; Miao, J. Q.; Lu, F. X. *J. Vacuum Scie. Tech.* **21**, 1939-1942 (2003).