

Structure and mechanical properties of nanostructured thin films by CFUBMS

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1. 서론

PVD hard coatings such as TiN, TiAlN and CrN have been developed which have good wear resistance and thermal stability [1, 2]. These general purpose hard coatings, however, have been limited to cutting processes involving high speed and lubrication free machining, owing to the decrease in hardness and oxidation resistance observed at elevated temperatures [3, 4]. Therefore, ternary and quaternary nanostructured hard coatings have recently attracted increasing interest owing to their unique properties [5].

2. 본론

In this study, quaternary CrTiAlN nanostructured thin films were synthesized by Closed Field Unbalanced Magnetron Sputtering (CFUBMS) and their characteristics were examined. The preferred orientation of the CrTiAlN nanostructured films deposited was formed CrN (111) and CrN (200) direction because the chemical composition of Cr was larger than other atoms. The black spot in CrTiAlN nanostructured films was proved to nanocomposite which grows at the $[\bar{1}13]$ direction using FFT method.

3. 결과

The microhardnesses of the CrTiAlN nanostructured films were measured to be in the range of 30 ~ 39 GPa. The highest microhardness value in the CrTiAlN nanostructured films was obtained when the grain size was approached at 2.9 nm. The resistance to plastic deformation was increased in the condition of the high hardness and the small grain size. However, the fracture toughness was increased in the condition of the low hardness and the large grain size. There was a critical grain size, d_c , at which a maximum value of the hardness was observed.

참고문헌

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