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Structure and mechanical properties of nanostructured thin films by CFUBMS

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1.Introduction

Industries such as the tool and forming industries are keenly interested in increasing the lifetimes of their components. This is a motivation for the choice of nitride coatings, which have been selected because of their mechanical properties such as hardness as well as wear resistance. Of the various coatings, titanium nitride has become an established industrial coating that is most commonly used in the tool industry [1]. However, TiN films are restricted to application of high speed tool industry due to their low hardness of ~ 20 GPa [2, 3]. Therefore, nanostructured coating materials have recently attracted increasing interest due to the unique properties, such as superhardness (H > 30 GPa), combined high hardness and toughness, or high hardness and low friction [4].

2.Experimental

In this study, the quaternary CrTiAlN nanostructured films are synthesized by Closed Field Unbalanced Magnetron Sputtering (CFUBMS) and the relationship of their microstructure and mechanical properties is investigated at various N_2 partial pressures.

3.Conclusion

Grain refinement of CrTiAlN nanostructured thin film is occurred by controlling N_2 partial pressure. Maximum hardness value according to the various N_2 partial pressures is approximately 40 GPa. It is also conformed that critical value of the grain size d_c needs to achieve the maximum hardness.

References

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