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#PLATH00149

INFLUENCE OF TITANIUM ADDITION ON THE PHASE COMPOSITION AND PROPERTIES OF TUNGSTEN BORIDES THIN FILMS

TRIB - Plasma-deposited protective and tribological coatings

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Abstract content

During latest years the transition metal borides due to combination of outstanding physical properties such as metallic conductivity, high incompressibility, high shear strength, and exceptionally high hardness are the subject of intensive research, especially in thin films form [1].

In this work doped by titanium tungsten borides coatings were deposited by Pulsed Laser Deposition (PLD) and RF magnetron sputtering methods. The (W,Ti)B_{4.5} targets with 0 to 24 at. % content of titanium were made by spark plasma SPS method. The XRD investigations shows that even small addition of titanium (8 at.% Ti) causes the change of phase composition, increase hardness, elastic modulus, oxidation and corrosion resistance. In the case of targets, the phase composition changed from 91.8% of WB₂ (P63/mmc) + 8.2% WB₃ (P6/mmc) to 4.6% WB₂ + 95.4% WB₃ for 0 and 8 at. %Ti respectively.

Deposited by RF-MS films from no doped target result in α - WB (I4/amd) phase and change to WB₃ (P6/mmc) with increase of titanium content to 24 at.%. In the case of PLD method deposited layers are consisted mainly with WB₃ phase (Fig.1). The hardness of all deposited films is in super-hard range H>40 GPa. RF-MS films are smooth in comparison with PLD layers (Fig.2) where surface is coated mainly by droplets. However, increasing of titanium content decreases the number and size of deposited particles. In summary, the presented work shows the possibility of controlling of phase composition, structure and morphology of thin films made of novel super-hard tungsten borides by adding titanium.

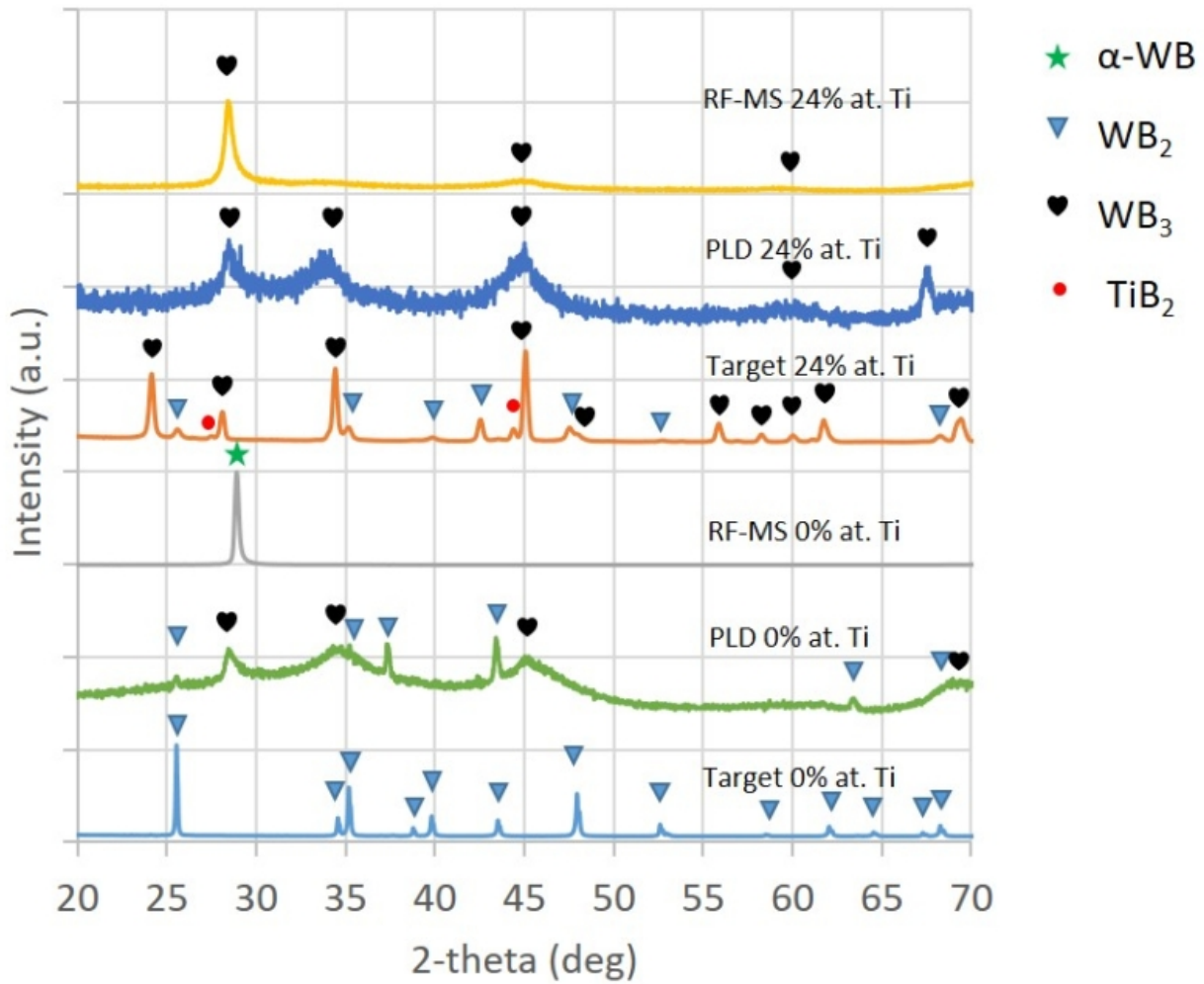
Thanks/Acknowledgement

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References

[1] V. Moraes, H. Riedl, C. Fuger, P. Polcik, H. Bolvardi, D. Holec, P.H. Mayrhofer Ab initio inspired design of ternary boride thin films Sci. Rep., 8 (2018), p. 9288

Phase composition of targets and coatings.



Morphology of a) RF-MS, b) PLD 0%Ti, c) PLD 24%Ti

