



### **INVITED: F4-2-ThM-3**

#### **Ternary Tungsten Boride Coatings with Improved Mechanical Properties Deposited by High-Power Pulsed Magnetron Sputtering from One Spark Plasma Sintered Target**

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Today the deposition of protective coatings with magnetron sputtering is well known in scientific laboratories and in industry also. However, there is an increasing need to coat larger and heavier tools. Also, sometimes substrate materials shouldn't be deposited at temperature greater than 300°C. This is a problem because some of novel materials like tungsten borides needs high substrate temperature (>400 °C) during deposition to obtain special mechanical properties. According to Thornton deposition model the deposition of films at lowered substrate temperature with exceptional mechanical properties (ZONE T) is possible by increasing of the energy of plasma. Such possibility gives a HIPIMS method. Additionally, this method allows to deposit defected by vacancies  $\alpha$ -WB<sub>2</sub> structure which according to first-principles calculation possess exceptional mechanical properties.

In this presentation the influence of HIPIMS parameters like the pulse duration, frequency and power and also the bias voltage and substrate temperature on ternary tungsten borides films properties will be shown and discussed. The deposited at 350 °C coatings by High-Power Pulsed Magnetron Sputtering from one Spark Plasma Sintered W-Ti-B<sub>z-x</sub> target are very hard (H>30 GPa) and possess high crack resistance. Additionally, they are thermally stable at temperature below 700 °C. The comparison between Titanium and Tantalum as a doping element will be presented also.

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