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Beryllium-Tungsten Study on Mixed Layers obtained by m-HiPIMS / DCMS Techniques in a Deuterium and Nitrogen Reactive Gas Mixture

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Abstract: Beryllium-tungsten 2 μm thick layers were co-deposited on molybdenum, graphite and silicon substrates in a reactive argon-deuterium/argon-deuterium-nitrogen gas mixture by means of combination of combining multi-pulse High Power Impulse Magnetron Sputtering and Direct Current Magnetron Sputtering techniques. The elemental composition and thickness of the layers were well controlled during the deposition process. Structural and chemical investigations were undertaken by means of X-ray diffraction and Rutherford backscattering methods. The results showed a change in the samples structure with the adding of nitrogen into the sputtering gas mixture, evidenced by the appearance of W_2N peaks in the diffraction patterns. The RBS showed in-depth uniformity of beryllium and tungsten concentrations for the deposited coatings. In order to investigate the deuterium retention mechanisms and to make an assessment of the deuterium inventory, thermal desorption spectrometry was performed. The deuterium desorption spectra for the batch of samples obtained with nitrogen showed an obvious behaviour of shifting to higher temperatures. This behavior may be related to the nitrogen desorption.

Keywords: Co-deposited mixed layer, Beryllium-Tungsten, Deuterium retention, Release mechanism

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