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Langmuir probe diagnostics and deposition modelling of a carbon-tungsten thermionic vacuum arc system

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Thermionic vacuum arc method developed at NILPRP [1-3] was proved to be very efficient in preparation of pure and composite refractory, tribological and magnetoresistive materials with industrial applications including coatings on the first wall of the fusion devices. This method offers a large degree of flexibility due to their unique properties (deposition in ultra high vacuum environment, ion energy control during deposition, etc). One of the method's advantages is the possibility to evaporate materials simultaneously from multiple targets and depositing on the substrates particles from all of them. Since there are many involved processes into this plasma deposition method, we performed investigations for a better understanding of the involved phenomena and process optimization. In this paper, using a 3-D plasma propagation mode we are modeling carbon plasma expansion and DLC film deposition in a single/double target (carbon - tungsten) and compare with experimental results. Considerations on process optimization and correlation with plasma parameters measured using Langmuir probe are also included.

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Keywords

Langmuir probe

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