

Seminar

Institute for Plasma Research

Title : Sputtering yield and nanopattern formation study of BNSiO₂ (Borosil) at elevated temperature relevance to Hall Effect Thruster

Speaker: Dr. Basanta Parida

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Date : 04th February 2022 (Friday)

Time : 11.00 AM

Venue : Online - Join the talk:

<https://meet.ipr.res.in/PostDoctalk-Basanta>

Abstract :

Lower sputtering yield of the discharge wall material is a crucial parameter for the performance of Hall Effect Thruster (HET) [1, 2]. In this article, we report the sputtering yield of HET wall material BNSiO₂ (borosil) at elevated temperature ~600 °C using quartz crystal microbalance (QCM). We observe a linear increase in the sputtering yield with temperature and it remains stable during long duration experiments using Xe ions. Two different crystallographic orientations of borosil give a slight variation in the yield. The higher yields for higher operating temperatures is proposed to be due to the thermal spike nature. Microscopic surface morphology shows only different grains of BNSiO₂, however high resolution nanoscopic view reveals the formation of nanoripple like structures over different grains [3]. The periodicity of such features increases with ion dose (sputtering time) and temperature in the range of 70-190 nm. Local curvature dependent erosion plays crucial role in such pattern formation [4].

Reference:

1. D.M. Goebel, I. Katz, Fundamentals of Electric Propulsion, Ion and Hall Thrusters, 2008.
 2. M. Ranjan, A. Sharma, A. Vaid, T. Bhatt, V. Nandalan, M.G. James, H. Revathi, S. Mukherjee, AIP Adv. 6 (2016) 95224
 3. R. M. Bradley, J.M.E. Harper, J. Vac. Sci. Technol. A 6 (1988) 2390
 4. B. K. Parida, Sooraj K P, S. Hans, V. Pachchigar, S. Augustine, Remyamol T, M. R. Ajith, M. Ranjan; Nucl. Inst and Methods B, 514 (2022) 1-7
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