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Increasing the surface production of negative ions from nitrogen doped diamond in low pressure hydrogen plasmas G. SMITH, J. ELLIS, T. GANS, J. DEDRICK, University of York, J. ACHARD, R. ISSAOUI, LSPM-CNRS, S. DOYLE, University of Seville, A. GIBSON, Ruhr-University Bochum, P. DIOMEDE, DIFFER, M. KUSHNER, University of Michigan, L. TAHRI, R. MOUSSOUI, C. PARANAUD, C. MARTIN, G. CARTRY, Aix-Marseille University — Plasma negative ion sources are of interest for material surface processing and neutral beam injection. Incorporating dielectrics as plasma facing surfaces can increase plasma control, but maximising the production yield remains a challenge. In this study, we investigate the production of negative ions from nitrogen doped diamond films in a low pressure deuterium plasma via mass spectrometry and Raman spectroscopy. The incorporation of nitrogen dopant into the film increases the negative ion yield when its temperature reaches 550°C and it becomes conductive. Pulsing the bias voltage enables the enhanced yield of negative ions to be maintained at lower temperatures (30 - 450°C) when the film is otherwise non-conductive. To better understand the mechanisms for production of negative ions, we undertake fluid/Monte-Carlo simulations, implementing a chemistry set that includes 14 molecular vibrational states of hydrogen (P Diomede et al 2017 Plasma Sources Sci. Technol. 26 075007), gas heating, and a model dielectric surface. *We wish to acknowledge financial support from EPSRC (EP/L01663X/1) and the French research federation (FR-FCM). The participation of M Kushner was supported by the US National Science Foundation and the US Department of Energy's Office of Fusion Energy Science.

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