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High Field Induced Chemistry on Sharp Metallic Tips and Its Effect on Field Emission Currents¹ C.H. CASTANO GIRALDO, D.N. RUZIC, M. AGHAZARIAN, Plasma-Material Interaction Group, University of Illinois at Urbana-Champaign., J.B.O. CAUGHMAN, Oak Ridge National Laboratory, Oak Ridge, TN. — Sharp tips of sub-micron radius, suitable to produce field emission, are being used to induce chemical reactions under a high electric field. We are studying the effect of vacuum chemical reactions on field emitters, and thus the emission current. Our final prospect is to achieve a better vacuum insulation capability to prevent breakdown in high voltage (HV) applications, such as in high-power antennas for fusion research. At present, concentrated field emission limits voltage hold off by about one order of magnitude below the theoretical predicted limit of several GV/m. Preliminary experiments in which chlorine (originating from CCl_4) reacted with copper (broad electrode) improved our voltage hold off from 50 to 94.7 MV/m, pointing to the possibility that chemistry can play a substantial role in HV systems. Different materials including nickel, copper, tungsten, and stainless steel are being tested.

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