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Effect of anode material on the breakdown in low-pressure helium gas. V.I. DEMIDOV, WVU, S.F. ADAMS, AFRL, A.A. KUDRYAVTSEV, SPbSU, I.P. KURLYANDSKAYA, INTEPH Technologies LLC, J.A. MILES, AFRL, B.A. TOLSON, UES, inc. — The electric breakdown of gases is one of the fundamental phenomena of gas discharge physics. It has been studied for a long time but still attracts incessant interest of researchers. Besides the interesting physics, breakdown is important for many applications including development of reliable electric insulation in electric grids and the study of different aspects of gas discharge physics. In this work an experimental study of the electric breakdown in helium gas for the plane–parallel electrode configuration has been conducted using a copper cathode and a variety of anode materials: copper, aluminum, stainless steel, graphite, platinum-plated aluminum and gold-plated aluminum. According to the Paschen law for studied electrode configuration, the breakdown voltage is a function of the product of gas pressure and inter-electrode gap. The breakdown processes on the left, lower pressure side of the Paschen curve have been the subject of this investigation. For those pressures, the Paschen curve may become multi-valued, where any given pressure corresponds to three breakdown voltage values. It was experimentally demonstrated that the form of the Paschen curve might strongly depend on the material of the anode and the cleanness of the anode surface. A possible explanation for this phenomenon is that electrons streaming from the cathode are reflected by the surface of the anode.

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