

Effect of the Mesh Transparency on the Electrical Characteristics of DC Pseudo Discharge

M. A. Abd AL-HALIM¹, A. ABU-HASHEM¹, and D. I. MOUBARAK²

¹Physics Department, Faculty of Science, Benha University, Benha 13518, Egypt

²Basic Science Department, Thebes High Institute of Engineering, Cairo 11434, Egypt

Abstract A DC pseudo discharge for air has been studied. Air pressure is used in the range between 0.7 Torr and 12 Torr. The breakdown occurs between a plane cathode and a mesh anode at transparencies of 19%, 46%, and 65%. The current-voltage characteristic curves of the discharge, which are measured at different pressures, distances, and mesh transparencies, take effect in the region of abnormal glow. The discharge voltage decreases as the air pressure increases, while more voltage is needed to maintain the discharge when either the mesh transparency or the inter-electrode distance is increased. An increment of mesh transparency causes high negative potential behind the mesh due to the high concentration of electrons, which accumulate and collide with neutral atoms. Paschen curves deviate from the expected regular one. The left side of Paschen curves appears at inter-electrode distance of 1 mm, whereas the right side appears at inter-electrode distance of 5 mm. The intermediate region is observed only at 3 mm distance between the two electrodes. For the transparency range used in this work, it is found that the decrement of the breakdown voltage, on the right side, depends on the mesh transparency. For different electrode separations, the measured Paschen curves are coincident and deviate from the standard ones of Paschen's law.

Keywords: pseudo discharge, mesh transparency, Paschen curves

PACS: 52.80.Hc

DOI: 10.1088/1009-0630/17/6/08

http://iopscience.iop.org/1009-0630/17/6/481/pdf/1009-0630_17_6_481.pdf