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Experimental study of the characterization of the main properties of DC- Glow discharge plasma experiment in ASU

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The (DC-GDPAU) is a DC glow discharge plasma experiment which was built and operated in Ain Shams University. It consists of discharge chamber, vacuum system, DC electrical circuit and digital storage oscilloscope. The cylindrical discharge chamber is made of stainless steel inside it there are two movable parallel circular copper electrodes (cathode and anode). The working data measured at (d) from 3 to 7 cm respectively. The minimum breakdown voltage () for each gap length from Paschen curves occurred at the pressure P of Ar gas 0.3 Torr. So, this is the operating pressure which used to get plasma at V in the range from 400 to 1800 volts. The plasma electrical parameters (Ip, Vp, Rp and Wp) are measured and calculated to produce complete characterization to the plasma. The and are measured by using double electric probe at radial distances r = 2, 4, 6, 8 cm to each gap length while the operating plasma current was 20 mA. The electron temperatures were in range from 7.96 eV to 10.44 eV at d = 3 cm, 6.58 eV to 7.65 eV at d = 5 cm and 7.33 eV to 7.99 eV at d = 7 cm. The ion density was in range from 0.91 × 1010 cm-3 to 1.79 × 1010 cm-3. From these results, it is clear that at gap length 7 cm the plasma temperature was almost constant at all radial distances. While at 3 cm this difference was bigger. So, as application, the samples which exposed to the plasma put at d = 7 cm. After studying the characterization of the plasma in this system, a PCB (printed circuit board) samples exposed to this plasma to study improving some properties of it. Digital optical microscope was used to show the changing in the shaping of the samples surfaces. From the images, there is change in the surfaces. It was studied in this paper to explain it. This is as part of the collaboration between EAEA and ASU. Also, the conductivity of the samples studied as collaboration between electronic unit and central physics laboratory unit in ASU, and the results showed that the resistance of copper decreased from Ω to Ω, this means that the conductivity of the samples increased. The hardness of this sample will study in the collaboration between Central Metallurgical Research & Development Institute and ASU.

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