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Spectroscopic study of shock waves generated in a supersonic arcjet helium plasma KAZUKI KOZUE, SHINICHI NAMBA, TAKUMA ENDO, KEN TAKIYAMA, Graduate school of Engineering, Hiroshima University, NAOKI TAMURA, National Institute for Fusion Science — Recently, we found that the shock cell appeared in an arcjet plasma expanding through a conical-shaped supersonic nozzle. In order to understand the characteristics of the shock wave, the visible/UV emission spectroscopy was carried out. The arcjet plasma was generated between an anode (copper) and a cathode (Ce/W) with a gap length of 2.5 mm and then expanded through the anode nozzle (throat diameter: 1.0 mm) into low pressure region (expansion section). The discharge current voltage and gas pressure were 40 A ∼30 V and ∼1000 mbar respectively. A visible spectrometer (focal length: 1.0 m, grating: 2400 grooves/mm) was used to measure the plasma emission The electron temperature was evaluated by Boltzmann plot of He I $2p^3Pnd^3D$ series (n =6, 7, 8 and 9), whereas the density was determined by Stark broadening (He I 438.8 nm). It was found that the density significantly increased at the shock region, which can be expected by the simple gas dynamic theory. However, no distinct change of the temperature was observed.

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