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Transient Response of Arc Temperature and Iron Vapor Concentration Affected by Current Frequency with Iron Vapor in Pulsed Arc TATSURO TANAKA, YOSHIFUMI MAEDA, SHINJI YAMAMOTO, TORU IWAO, Tokyo city university — TIG arc welding is chemically a joining technology with melting the metallic material and it can be high quality. However, this welding should not be used in high current to prevent cathode melting. Thus, the heat transfer is poor. Therefore, the deep penetration cannot be obtained and the weld defect sometimes occurs. The pulsed arc welding has been used for the improvement of this defect. The pulsed arc welding can control the heat flux to anode. The convention and driving force in the weld pool are caused by the arc. Therefore, it is important to grasp the distribution of arc temperature. The metal vapor generate from the anode in welding. In addition, the pulsed current increased or decreased periodically. Therefore, the arc is affected by such as a current value and current frequency, the current rate of increment and the metal vapor. In this paper, the transient response of arc temperature and the iron vapor concentration affected by the current frequency with iron vapor in pulsed arc was elucidated by the EMTF (ElectroMagnetic Thermal Fluid) simulation. As a result, the arc temperature and the iron vapor were transient response as the current frequency increase. Thus, the temperature and the electrical conductivity decreased. Therefore, the electrical field increased in order to maintain the current continuity. The current density and electromagnetic force increased at the axial center. In addition, the electronic flow component of the heat flux increased at the axial center because the current density increased. However, the heat conduction component of the heat flux decreased.

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