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LTE Experimental Validation in a Gas Metal Arc Welding Plasma Column

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Abstract: During gas metal arc welding (GMAW), the plasma obtained has a rich composition and some hypothesis are often made for modelling, in particular the local thermodynamical equilibrium (LTE) state of the plasma. It is then important to study its validity domain, as it is also needed for plasma parameters determination.The plasma was investigated using optical emission spectroscopy. The electron temperature and density were determined from Stark width measurements, independently of the plasma equilibrium state, and compared to the excitation temperature obtained using the Boltzmann plot (BP) method. The welding experiments were made at arc current of 330 A, with pure argon as shielding gases. The LTE is verified in the core region of the plasma, for about one half of the column radius in the arc lower part.

Keywords : GMAW, Optical Emission Spectroscopy, Boltzmann Plot, Sola method, LTE