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Characterization of Anode Boundary Layer of a High Intensity Arc with Cross Flow[1] GUANG YANG, JOACHIM HEBERLEIN, EMIL PFENDER, Department of Mechanical Engineering, University of Minnesota — Anode boundary layers of high intensity arcs are characterized by large gradients in temperature, electrical potential and velocity. They determine anode life time and processing efficiency in many industrial applications. It has been shown that when a strong cold cross flow is applied to a high intensity arc, a new anode arc attachment mode can be formed, with a larger anode boundary layer area and thus smaller thermal load to the anode. In this study, we have used Langmuir probe and laser Thomson scattering diagnostics to measure the electron temperature and electron density in the anode boundary layer for this attachment mode for an atmospheric pressure argon arc. The arc is operated with working gas flow rates from 2 slpm to 18 slpm, and with currents from 50A to 100A. Argon and nitrogen are used as cross flow gases, and they have been shown to have quite different effects on the anode attachment. Our results indicate a strong effect of the attachment mode on the electron temperature and steeper electron density gradients than predicted by models.

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