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#### **SESSION 4: WELDING AND COATING, SALON E**

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## **Effect of Ce on microstructure of coarse grain heat affected zone in large heat input welding**

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### **ABSTRACT**

Laser scanning confocal microscopy and Gleeble physical simulator were used to investigate the effect of Ce on microstructure of weld metal coarse grain heat-affected zone (CGHAZ) in large heat input submerged arc welding. The results show that there were lots of tiny cerium oxysulfide inclusions in the Ce-alloyed weld metal CGHAZ. Cerium oxysulfide inclusions can inhibit austenite grain boundary migration by pinning effect; therefore, austenite grain growth was suppressed and austenite grains were refined. Cerium oxysulfide inclusions can also induce nucleation of acicular ferrite (AF) and sympathetic nucleation. AF in Ce-alloyed weld metal CGHAZ consists of AF induced by inclusions, sympathetic AF, and home-position precipitated AF, and they together improved the percentage of AF in weld metal CGHAZ and toughness. Ce can segregate at austenite grain boundaries, reduce proeutectoid ferrite transformation start temperature, and inhibit the formation of proeutectoid ferrite. Ce can also improve acicular ferrite transformation start temperature, therefore increasing the percentage of acicular ferrite in weld metal CGHAZ.

**KEYWORDS:** physical simulation, weld metal CGHAZ, cerium, acicular ferrite