Hot Ductility Behavior of a Continuously Cast Steel During Solidification

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The hot ductility behavior of simple as-cast construction steel has been studied in order to analyze the surface cracking mechanism during the continuous casting process. Tensile specimens were heated to the melting point, cooled to a temperature range between 650°C and 1100°C and were strained with 10^{-3} and 10^{-2} s^{-1} to rupture. The tests were conducted on a unique thermo-mechanical testing machine without using any protective devices. Hot ductility curves of reduction of area vs. testing temperature and metallographic examinations have been used to depict the cracking susceptibility of the investigated steel. The preceding melting and the subsequent solidification process produce very coarse grains as well as voids, which strongly influence the materials cohesion and therefore significantly reduce the deformability. The ductility starts decreasing at 900°C in the single phase γ-region, characterized by grain boundary sliding and surface cracks, reaches a minimum in the two-phase α-γ-region at 750°C and slightly increases with decreasing testing temperature. Distinct intergranular fracture and poor ductility was observed between 700°C and 800°C.

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