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Structure and mechanical properties of high-strength lightweight steels prepared by near rapid solidification

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ABSTRACT

Fe–Mn–Al–C light-weighted steels exhibited superior mechanical properties while at low densities, possessing great potentials for applications in many industrial fields, in particular in automotive industry, as they meet the strict requirements in vehicle safety and low fuel consumption. However, with the high Mn and Al contents, it is hard to produce them by conventional continuous casting, since during hot rolling cracks could easily form in the slab, and severe edge cracks could emerge because of their relatively low thermal conductivity while high deformation resistance. Strip continuous casting (SCC) is a kind of near-net shape method, which has been successfully applied to produce stainless steels. It combines casting and rolling into one step, directly yielding thin (1–15 mm) strips from liquid metals. Producing the low-density steels with high Mn and Al contents by SCC may provide a way for industrial application, which solves the problem in conventional continuous casting in a simple procedure. Noteworthy, the SCC is a sub-rapid solidification process. In present work, we prepare the near-net shape Fe–Mn–Al–C-based low-density steel by using the sub-rapid solidification.

KEYWORDS: lightweight steels, near rapid solidification, strip continuous casting, high Al steel, high-strength light steel