

Effect of Rare Earth Elements on Liquidity and Mechanical Properties of Phase Formation Reaction Change in Cast Iron by Cooling Curve Analysis

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Abstract : In this research analyzed the effects that phase formation reaction change in the grey cast iron makes on characteristics of microstructures, liquidity, and mechanical properties through cooling curve when adding rare earth elements (R.E). This research was analyzed with comparison between the case of not adding the rare earth elements (R.E) into the grey cast iron with the standard composition (as 3.3%C-2.1%Si-0.7%Mn-0.1%S) and the case of adding 0.3% rare earth elements (R.E). The thermal analysis parameters have been drawn through eutectic temperature theoretically calculated, recalescence temperature, and undercooling temperature measured from start of eutectic reaction to end of solidification in the cooling curve obtained by thermal analysis to analyze formation behavior of graphite, and the effects by addition of rare earth elements on this have been reviewed. When adding rare earth elements (R.E), the cause of liquidity slowdown was analyzed through the solidification starting temperature and change of solidification ending temperature. The strength and hardness have been measured to evaluate the mechanical properties, and the sound tensile strength has been evaluated through quality coefficient after measuring relative hardness and normality degree of tensile strength by calculating theoretical tensile strength and theoretical hardness. The change of Pearlite Inter-lamellar Spacing of matrix microstructure and eutectic cell count of macrostructure was measured to analyze the effects of the rare earth elements on the sound tensile strength. The change of eutectic cell count has been clarified through activation of the eutectic reaction, and the cause of pearlite inter-lamellar spacing clarified through eutectoid reaction temperature.

Keywords : cooling curve, element, grey cast iron, thermal analysis, rare earth element

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