

## Designing, Processing and Isothermal Transformation of Al-Si High Carbon Ultrafine High Strength Bainitic Steel

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**Abstract :** High-carbon, silicon-rich steels are commonly suggested to obtain very fine bainitic microstructure at low temperature ranged from 200 to 300°C. Thereby, the resulted microstructure consists of slender of bainitic-ferritic plates interwoven with retained austenite. The advanced strength and ductility package of this steel is much dependent on the fineness of bainitic ferrite, as well as the retained austenite phase. In this article, Aluminum to Silicon ratio, and the isothermal transformation temperature have been adopted to obtain ultra high strength high carbon steel. Optical and SEM investigation of the produced steels have been performed. XRD has been used to track the retained austenite development as a result of the change in the chemical composition of developed steels and heat treatment process. Mechanical properties in terms of hardness and microhardness of obtained phases and structure were investigated. It was observed that the increment of aluminum to silicon ratio has a great effect in promoting the bainitic transformation, in tandem with improving the stability and the fineness of retained austenite. Such advanced structure leads to enhancement in the whole mechanical properties of the high carbon steel.

**Keywords :** high-carbon steel, silicon-rich steels, fine bainitic microstructure, retained austenite, isothermal transformation

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