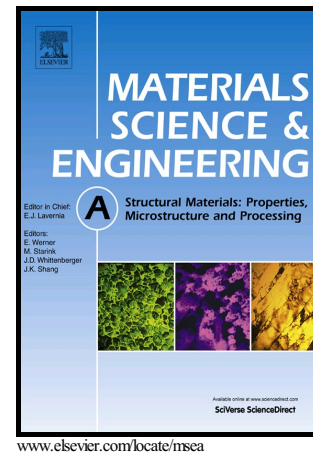


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## Investigating of the tensile mechanical properties of structural steels at high strain rates

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### Abstract

St37 and St52 structural steel plates were tested in uniaxial tension at room temperature over various strain rates ranging from 0.001/s to 0.1/s. The yield stress, flow stress and fracture behavior of steels were analyzed. It was found that the strain rate has a strong effect on the tensile mechanical properties of St37 steel, while St52 has a less sensitive strain rate and that the yield strength of both steels exhibits a higher strain sensitivity rate than the other mechanical properties. An increase in the loading rate from 0.001/s to 0.1/s led to a %30 increase in the lower yield strength of St37 steel and an increase of %6 for St52. The equations were derived to express the yield stress behavior with the strain rate. The ductile dimple fracture was observed in static and dynamic conditions; however, increasing the strain rate resulted in a pronounced cleavage-type fracture in both steels. The St37 fracture strain decreased considerably by increasing the strain rate.

**Keywords:** Structural steels; High strain rates; Deformation behavior; Constitutive modeling

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