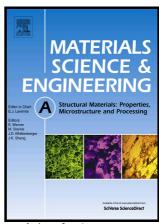
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### **ACCEPTED MANUSCRIPT**

Effect of carbide precipitation on strain-hardening behavior and deformation mechanism of metastable austenitic stainless steel after repetitive cold rolling and reversion annealing

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#### Abstract

A metastable austenitic stainless steel was repetitively cold rolled and reversely annealed. The strain-hardening behavior and deformation mechanism during tensile testing were comparatively studied for the specimens annealed at 800 °C and 1000 °C. Fine-grained austenite with uniformly distributed carbides was formed in the 800 °C-annealed specimen, whereas coarse-grained austenite without carbides was obtained with annealing at 1000 °C. Continuous strain hardening was achieved in all specimens, which could be attributed to the strain-induced martensite and deformation twining for the annealed specimens at 800 and 1000 °C, respectively. The carbide precipitation promoted the formation of strain-induced martensite due to the depletion of austenite stabilizers.

Keywords: Austenitic steel; Rolling; Annealing; Carbide precipitation; Strain hardening; Deformation mechanism.

#### 1. Introduction

Grain refinement is a viable approach to improve the strength of engineering metals and alloys [1, 2]. Severe plastic deformation processes, such as equal channel angular pressing [3], high pressure torsion [4], accumulative roll bonding [5], multiple compression [6], and

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1

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