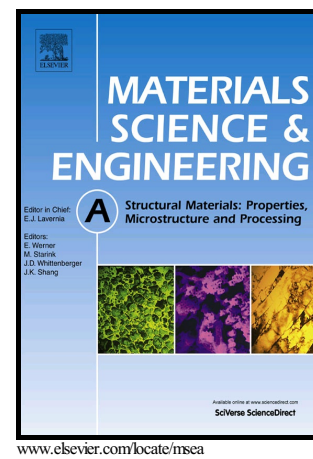


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# Investigation of forming process of the third-generation automotive medium-Mn steel part with large-fractioned metastable austenite for high formability

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## Abstract:

With the increasing requirement of lightweight and safety of automotive industry, the third-generation automotive medium-Mn (TAMM) steel with large-fractioned metastable austenite has been newly developed in order to enhance the strength and guarantee the formability. In this paper, the effect of plastic deformation condition, such as strain direction and strain rate, on mechanical properties and microstructure of TAMM steel is firstly investigated. The results show that the TAMM steel holds isotropic characteristic and the effect of strain direction and strain rate on mechanical properties can be neglected. Furthermore, the two-step forming process of TAMM steel is studied step by step to understand the effect of pre-forming on final forming. On the one hand, the martensitic transformation and work hardening during pre-deformation increase the strength but decrease the uniformity of mechanical properties, which decreases the final formability. On the other hand, with the increase of pre-strain, the enhanced yield strength, lengthened yield platform and undulating work hardening rate during final forming increase the probability of the crack. The simulated and experimented results prove that one-step forming process is suitable for the TAMM steel part with complex shape because the TRIP effect during

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