

## Additive manufacturing of maraging steel on low alloyed high strength TRIP steel

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### Abstract:

Hybrid parts were successfully produced by additive manufacturing of maraging steel 18Ni 300 grade on the top of low alloyed advanced high strength steel. High strength steel was alloyed by 0.2% C, 1.5% Al, 0.5% Si, 1.5% Mn and micro alloyed by 0.06% Nb (all in weight %). The steel was prepared in the form of bars either directly in as-forged and air cooled state or after two step heat treatment typical for TRIP (transformation induced plasticity) steels. Subsequent additive manufacturing of maraging steel was carried out by selective laser melting (SLM) in the EOS M290 machine using parameters recommended for tool steels by printer supplier. Suitable post processing heat treatments were applied to hybrid parts to relieve residual stresses and to achieve desired mechanical properties. Hybrid parts were subjected either to solution annealing or to two step heat treatment with the second hold in the temperature region of bainitic transformation. The best combination of ultimate tensile strength of 860 MPa and total elongation of 19% was obtained for hybrid part where high strength steel underwent two step steel heat treatment prior to additive manufacturing and no post-processing was carried out after additive manufacturing. The joints were characterised by light and scanning electron microscopy, hardness measurement across the interface and tensile test of the joint area. Detail characterisation of interface area microstructure and local chemical composition was carried out.

### Key words:

Selective laser melting, maraging steel, hybrid joints, high strength steel