Effect of molybdenum on high temperature flow behavior of Fe30Mn5Al1C-xMo lightweight austenitic steels

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Lightweight austenitic steels based on Fe-Mn-Al-C system can be good candidate materials for high temperature applications. Studies related to understanding the behavior of these class of alloys at high temperatures are limited and needs further investigation. Four light weight austenitic steels Fe30Mn5Al1C(0-3)wt%Mo were designed with varying Mo concentration and processed through vacuum induction melting route followed by thermo-mechanical processing. The cold-rolled alloys were annealed to common grain size (~80µm) and their tensile deformation behavior in the temperature range of 300K to1073K and at a strain rate of $10^{-3}s^{-1}$ are studied. The flow strength of the alloys increased with the increase in the molybdenum and decreased with increase in temperature. The solid solution strengthening by molybdenum is the reason for the observed behavior. The serrated flow behavior was observed at higher temperature and is attributed to dynamic strain ageing. The microstructural correlation with observed mechanical properties will be discussed [1-2].

Key words: Lightweight austenitic steels, Tensile tests, Electron Back Scattered Diffraction (EBSD), MicroVickers hardness.

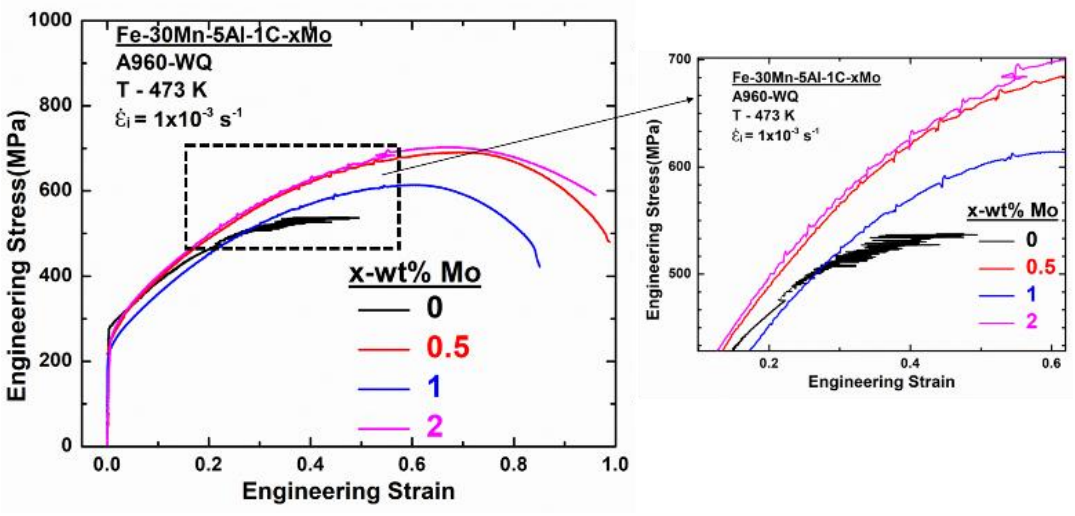

Fig.1 Serrated flow behavior in the alloys tested at 473K

References:

[1] Grässel O et al ,High strength Fe-Mn -(Al , Si) TRIP / TWIP steels development-properties-application Int. J. Plast 16 (10-11) (2000), pp.1391–1409

[2] Moon J et al, Investigations of the microstructure evolution and tensile deformation behavior of austenitic Fe-Mn-Al-C lightweight steels and the effect of Mo addition, Act Mater. 147(2018), pp.226–235