

ASYMMETRIC MECHANICAL PROPERTIES OF TRIP980 AND TWIP980 STEEL SHEETS AT VARIOUS STRAIN RATES

Geunsu Joo* and Hoon Huh*

*School of Mechanical, Aerospace and Systems Engineering, KAIST,
291 Dahak-ro, Yuseong-gu, Daejeon 305-701, Republic of Korea,
*hijgs@kaist.ac.kr, **hhuh@kaist.ac.kr

ABSTRACT This paper is concerned with asymmetric mechanical properties of TRIP980 and TWIP980 steel sheets at various strain rates. TRIP980 and TWIP980 steel sheets have a yield asymmetry between in-plane tension and compression because of their deformation mechanics such as transformation induced plasticity and twinning based plasticity. The deformation mechanics are also influenced by the strain rate.

In this paper, rate dependent asymmetric mechanical properties are acquired from in-plane tension and in-plane compression tests at various strain rates ranging from 0.001 s^{-1} to 100 s^{-1} . In order to perform in-plane compression tests at intermediate strain rates with a High Speed Material Testing Machine (HSMTM), an improved compression device is developed to convert loading direction from tensile loading to compressive loading.

Rate dependent asymmetric mechanical properties are observed from true stress–true strain curves at various strain rates ranging from 0.001 s^{-1} to 100 s^{-1} . For the TRIP980 steel sheet, the yield strengths in-plane compression are larger than that in-plane tension at all strain rate conditions. The flow stresses become similar in-plane tension and compression after a strain of 0.06 at all strain rate conditions. For the TWIP980 steel sheet, the yield strengths in-plane compression are smaller than that in-plane tension at all strain rate conditions. The flow stresses in-plane compression are smaller than those in-plane tension at all strain rate conditions.