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Shock Wave Profile and Bauschinger Effect in Depleted Uranium[1]

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Bauschinger effect is observed in many metals and is characterized by a microstructural stress distribution that results in an increase in compressive yield strength at the expense of tensile yield strength. Experiments to explore this phenomena are accomplished by applying a stress to the specimen in one direction to the yield point and then reversing the direction of the applied stress to the same magnitude. When the loading is applied in the negative direction, materials displaying the Bauschinger effect will yield before reaching the same load that yielding occurred at in the positive direction. This series of experiments applies uniaxial compressive loading followed by uniaxial tensile loading (negative direction of compressive load) by means of plate impact experiments on depleted uranium samples. Wave profiles are observed with VISAR to compare the HEL during the compressive loading with the HEL seen during release while the sample undergoes tensile loading. The expected 2 wave structure (elastic-plastic behavior) is observed during the compressive loading (shock up), but this structure is diminished on the release portion of the wave profile indicating a diminished yield strength during the tensile loading.

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