

INVESTIGATING THE EFFECT OF THERMO-MECHANICAL TREATMENT ON TOUGHNESS AND MACROSCOPIC WORK-HARDENING RATE OF LEAD ALLOY

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ABSTRACT

The effect of deformation, deformation rate and temperature on the toughness and macroscopic work-hardening rate of a recycled lead alloy part whose chemical composition is shown in table 1 was investigated in the temperature range of room temperature to 200°C, and in the deformation rate range of 0.3s⁻¹ to 2.3s⁻¹. A high-low-temperature thermo-mechanical treatment technique was employed for this study. Lead alloy from waste batteries of cars were recycled into simple cylindrical parts by means of sand casting. The specimens were then heated to the required temperatures and then quenched in water before subjecting it to deformation. Deformation process was carried using an extruder at the Makeri Smelting Company in Jos. The toughness increased when the deformation, deformation rate and temperature were increased. A deformation of 99.5% at temperature of 150°C and at deformation rate of 1.9s⁻¹ resulted in a toughness of 16.94MN/m². Also, macroscopic work hardening rate increased with increased in deformation.

KEYWORDS: Thermo, Mechanical Treatment, Toughness, Mascropic, Work-Hardening Rate, Deformation, Deformation Rate and Temperature