Improving the sheared edge in the blanking of commercial AZ31 sheet through texture modification

Commercial rolled magnesium sheets of alloys AZ31 (Mg-3 mass%Al-1 mass%Zn) and ZE10 (Mg-1 mass% Zn-<1 mass% Rare Earths) in O-temper condition were used for blanking experiments near room temperature. A serrated fracture surface can be observed in case of AZ31 but not in case of ZE10. During the shearing process of the AZ31 sheet, many micro cracks parallel to the sheet plane are generated in the shearing zone. These micro cracks lead to the formation of loose particles during the shearing operation, which interfere with further processing of the part and incur additional costs by increasing the scrap rate. It is found that the strong basal texture of this alloy is an important reason for the generation of such serrated cracks. In this paper a new method of selective texture modification is described to locally change the mechanical properties of the AZ31 sheet. Subsequent shearing experiments show a significant change in the material behavior, especially regarding the direction of crack propagation, which leads to a better shearing performance. The commonly observed serrated crack does not occur any more after this local treatment and the sheared edge is clearly improved.

AZ31; Blanking; Magnesium; Sheared edge; Shearing; Texture; Twinning