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## Surface engineering of spray-formed aluminium-silicon alloys by plasma nitriding and subsequent electron beam remelting

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### Abstract

*Ever-increasing requirements on the abrasive wear behaviour of locally highly stressed components and the need for lightweight constructions make new solutions for the surface treatment of aluminium alloys increasingly necessary.*

*The present paper presents the initial results of a novel combined surface treatment technology consisting of plasma nitriding (PN) with subsequent electron beam remelting (EBR). A spray-formed Al alloy substrate was used for the investigations because of its special chemical composition, with high contents of Si, Fe and Cu. This made it possible to generate microstructural changes during EBR that were beneficial for the desired increase in hardness. The treatment sequence plasma nitriding with subsequent electron beam remelting was performed to avoid the loss of hardness (previously won by EB remelting) during the thermal cycle of plasma nitriding (480 °C). The great difference between the melting temperature of the AlN layer (approx. 2200 °C) and the Al alloy substrate (approx. 650 °C) facilitated the novel treatment sequence. The very hard and thin AlN layer was supported by the EBR layer underneath. The duplex layers generated in this manner exhibited good metallurgical bonding to the substrate. In this way, it was possible to achieve a hardness gradient that resulted in a wear volume 10 times lower than that of the untreated Al substrate.*

Keywords: Electron beam, Remelting, Spray-formed aluminium alloy, Microstructure, Wear

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