PO1071

# Plasma nitriding of Al alloys – process technology and surface properties

Anke Dalke, Heinz-Joachim Spies, Horst Biermann

IWT/ TU Bergakademie Freiberg, Freiberg, Germany

dalke@ww.tu-freiberg.de

Plasma nitriding is an efficient and ecological surface treatment enhancing the hardness and wear performance of Al materials. In contrast to steels, the nitride layer formation is an outer nitriding mechanism. Due to this, the treatment technology strongly differs especially concerning the interactions between plasma and materials surface. These processes are investigated using plasma diagnostics, e.g. OES measurements.
Nitriding of Al alloys leads to the formation of hard and dense AlN surface layers. The nitriding behavior is influenced by alloying elements like magnesium and silicon. The resulting properties gradient between the very hard nitride layer and the soft Al matrix limits the load capacity of the AlN layer. Electron beam (EB) surface alloying offers a possibility to modify the chemical composition in a surface near area generating hard and thermal stable surface layers that can provide the function of support for the AlN layer. The additive materials used for surface alloying can influence the resulting nitride ability.
In the present work, the surface modification of Al alloys by plasma nitriding and by a combination of electron beam (EB) surface alloying and plasma nitriding have been investigated. For EB surface alloying additional materials basing on Fe, Cr, Cu, Co and Ni were used. Plasma nitriding of Al alloys and the EB alloyed state was carried out by using adequate treatment condition. The effect of the particular alloying elements on the nitridability was investigated. Furthermore, the metallurgical compatibility of both technologies was examined. The nitride layer support was investigated by means of hardness measurement and wear tests.
The relations between treatment conditions, structure and properties of both the EB alloyed and plasma nitrided condition, as well as the resulting properties of the compound layers were examined and will be discussed.

**Keywords**
nitriding
aluminium
surface alloying
nitride layer
wear