

POF008

## **Investigations on the two step process of plasma electrolytic based etching**

Maik Froehlich

University of Applied Sciences Zwickau, Zwickau, Germany

maik.froehlich@fh-zwickau.de

Plasma electrolytic polishing allows modifying material surfaces by etching. Depending on the starting surface roughness it can be decreased down to several nm. This process works under atmospheric pressure in an electrolytic bath. The conductive substrate which shall be etched is on positive potential (anode) and the box with the electrolytic bath on mass potential (cathode). The potential difference is in the range of 100 to 400 V, approximately. Due to strong heating induced by high current the electrolyte around the substrate evaporates leading to the formation of a thin gaseous layer in which the plasma is formed containing a lot of different species.

The etching process consists of two steps which are not well understood, yet. During the first one the elements (principally not all) of the substrate material (e.g. stainless steel) are reacting with the negative ions, formed in the plasma, at the surface. That leads to a formation of one or more reaction products still staying at the material surface. In the second process step the reaction products are removed by further plasma chemical processes. Especially the last step is remarkably influenced by the conductivity of the electrolyte as well as the voltage applied at the substrate.

In this talk results will be presented and discussed related to investigations on the etching of iron based material. Surface analytics provide information about the effect of applied voltage, conductivity of the electrolytic bath and the correlation of both focusing on understanding the two step etching process.

### **Keywords**

plasma electrolytic polishing

etching

liquid