ORG102

Highly productive pretreatment of metallic substrates

Jens-Peter Heinß, Lars Klose

Fraunhofer FEP, Dresden, Germany

jens-peter.heinss@fep.fraunhofer.de

Substrate pretreatment is the first step in the quality chain of coating technologies. A sputter etching process for metal substrates based on hollow-cathode arc discharge plasma sources has been developed for this purpose. The main advantage is the realized high etching speed. This represents the precondition for highly productive and cost-effective lines. Technically, this is caused by the high plasma density generated by an arc discharge source.
Ion currents with a density of up to 50 mA/cm^2 could be extracted from the plasma zone to the substrate. Etching rates of 40 nm/s were achieved on copper substrates. Nearly defect-free surfaces could be obtained after pretreatment by implementing a mid-frequency bias power source in combination with fast arc detection and suppression.
The plasma source was completed with a solenoid in a separate equipment. The magnetic field can elongate the plasma plume nearly to the meter range. The collected spatial ion current distributions reflect different regimes. They depend from the gas flow through the hollow cathode and the adapted background pressure and scale with the discharge current. The different characterizations will be presented in detail.
A process version was realized where the bias voltage is applied to the plasma source. Consequently, the substrates can remain on ground potential during the sputter etching pretreatment. This presents an advantageous simplification for the equipment design, for example for the pretreatment in strip coating lines. Furthermore, the method was adapted for the highly productive pretreatment of parts.

Keywords
highly productive pretreatment
vacuum surface cleaning
sputter etching
hollow cathode arc discharge