Reduction of Brass Corrosion Layers Using Hydrogen Plasma
Effects of various mean powers of plasma discharge

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Samples of brass were chosen for this study. Corrosion layers were prepared in two different corrosion atmospheres; in the ammonia atmosphere and in the atmosphere of hydrochloric acid. The corrosion layers had been formed for four weeks. After that samples were dried and stored in plastic ziplock bags before plasma application.

The treatment was carried out in a Quartz cylindrical reactor (90 cm long and 9,5 cm in diameter). The reactor was surrounded by two external copper electrodes. A radio-frequency electric field (13,56 MHz) was applied. The experiment usually took place at hydrogen pressure of 150 Pa and hydrogen flow rate of 50 sccm.

Plasmachemical treatment is based on generation of reactive atomic hydrogen in plasma discharge. This atomic hydrogen reacts with the corrosive layer containing oxygen. This reaction creates an unstable OH radical, which emits light in the region of 305–320 nm. This radiation is detected by the optical emission spectroscopy and therefore in our work, it was applied as a process monitoring quantity. Rotational temperatures and intensity of OH radicals were determined from obtained data.

Effects of various mean powers of plasma discharge were compared in this research. Samples were treated in 100 W continual regime, 200 W 50% pulsed regime, 300 W 33% pulsed regime, and 400 W 25% pulsed regime. Plasma discharge was switched on for the whole time in the continual regime. The discharge was switched on and switched off ($t_{on}/_{off}$) in the order of milliseconds in the pulsed regime. For example, 25% pulsed regime means that the discharge is switched on for 0,25 ms (t_{on}) and it is switched off for 0,75 ms (t_{off}) with the frequency of 1000 Hz. Heating of sample in the pulsed regime is significantly lower. Moreover the process kinetics is different in each regime.

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