

THE ROLE OF PHOSPHORIC ACID IN ELECTROPOLISHING OF STAINLESS STEEL

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INTRODUCTION:

Electropolishing is one of the useful tools to improve the surface finish of a metallic work piece by anodic dissolution process. In Electropolishing the anode surface is smoothed and brightened by the use of appropriate electrolyte under optimum conditions of current density and temperature. Electropolishing of Stainless Steel is widely practiced in industry from phosphoric acid based electrolytes. Also a high percentage of phosphoric acid electrolyte compositions at high current densities and temperatures for Electropolishing of stainless steel are cited in literature [1,2]. Electropolishing of stainless steel has extensive applications in industry [3,4]. Electropolishing technique plays a vital role in vacuum technology, preparation of samples for metallography and electron microscopy.

EXPERIMENTAL:

The Electropolishing baths for stainless steel with various concentrations of phosphoric acid from 10-75% by vol were tried. The bath composition has been given in the Table 1. The bath was prepared by adding sulphuric acid to the phosphoric acid slowly and thoroughly mixing. The stainless steel panels (carbon 0.08% (max.) by wt, chromium 18 to 20% wt, nickel 8 to 11.0% by wt, Iron-balance, other elements-2.05 (max.) by wt) of size 5x2.5x0.1 cm were cut with a stem of 3 cm length and the edges of the panels were well ground to remove the burrs. The panels were degreased with Trichloroethylene and washed thoroughly in running tap water followed by a rinse in deionized water and then air-dried. With this Electropolishing electrolyte, weight loss measurements, reflectivity and impedance measurements were made.

RESULTS AND DISCUSSION:

WEIGHT LOSS MEASUREMENTS:

The effect of current density, time and temperature on the weight loss of metal was investigated. Weight loss measurements are carried out at current densities 20, 40, 50, 70 A/dm^2 at temperatures 30°, 50°, 70°C for various times. The bath concentration is optimized at 50% by vol of phosphoric acid from the better reflectivity of the polished stainless steel. The increase in weight loss with current densities and temperatures for various times is shown in figures.

TABLE 1: BATH COMPOSITION

INGREDIENTS	COMPOSITION
Orthophosphoric acid	10-75% by vol.
Sulphuric acid	25% by vol.
Water	Balance.

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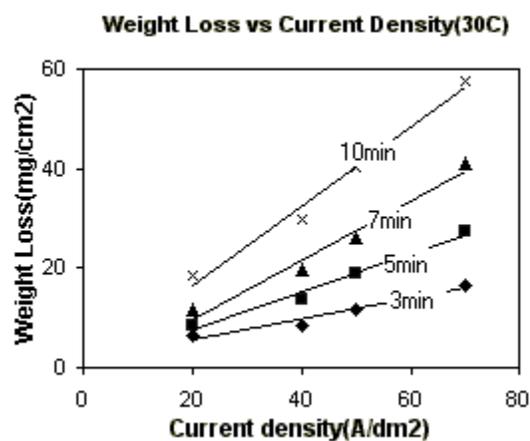


Figure 1

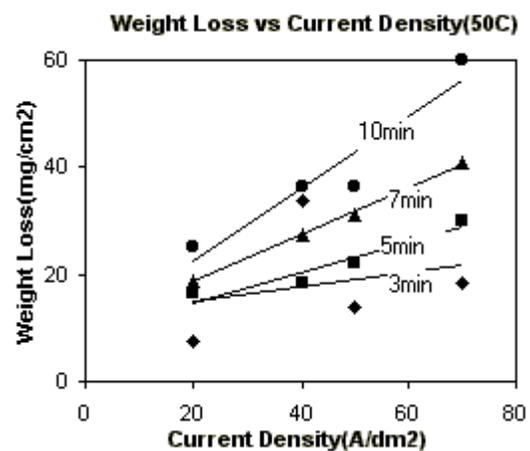


Figure 2

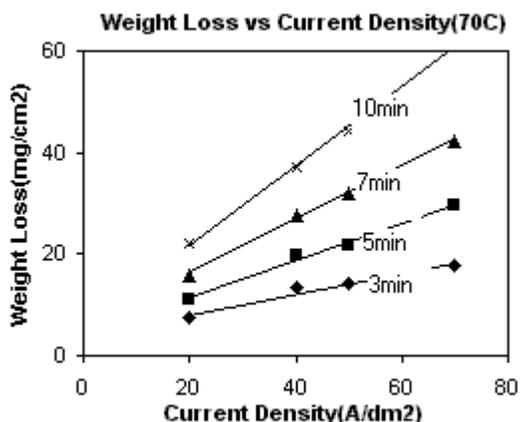


Figure 3

CONCLUSION:

The optimum concentration of phosphoric acid for electropolishing of stainless steel was found out. The brightness of the stainless steel is best at 50% by vol of phosphoric acid bath conditions compared to other baths.

REFERENCES:

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