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NEW FRIENDLY ENVIRONMENTAL ETCHING TECHNOLOGIES FOR SOME STEELS AND COPPER ALLOYS

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Abstract: *New compositions containing some organic inhibitors were tested in the carbon steels and copper alloys etching processes. The analysis of the etching efficiency and harmful products emission proves that significant reduction in the specific discharge of the waste waters and emission of nitrogen oxides can be achieved at the appropriate etching quality.*

This reduction is caused mainly by adsorption of the organic inhibitors on the metal surface by decreasing its excessive dissolution. On the other hand, the effective aggregation and dispersion of the corrosion products promotes faster transportation of the rust and dross particles away from the treated metal surface reducing the total processing time.

Keywords: *environmental safety; corrosion; etching; carbon steels, copper alloys*

1. Introduction

The galvanic industry is the second highest pollution source after the surface transport branch and it causes continuous and long-lasting contamination of the entire environment (air, water and soil). Therefore, the extensive efforts should be directed to prevent this dangerous contamination bringing many aggressive components of the galvanic (including metals etching) composition into the environment [1-7].

Among the others, the metal etching technologies produce significant amounts of the air and water pollution agents and extended activity is directed onto investigation of possible mitigation steps, which should provide same etching quality and efficiency at lower emission of pollutants.

Sulfuric, hydrochloric and nitric acids are used as the main components for the low-alloy carbon steel etching compositions [2-3]. Significant amounts of iron can dis-

solve in sulfuric acid during this process while dissolution of iron in the hydrochloric acid compositions is less influential. On the other hand, a rate of the metal rust and scale dissolution in the latter compositions is higher than in the former, therefore, the hydrochloric compositions are more suitable for the low-alloy carbon steel etching [2, 3, 8]. An optimal content of sulfuric acid in the regular etching compositions is 20-22 %; hydrochloric acid – 18-20 %. Additional organic substances are usually added to the both types of the compositions to counteract excessive metal dissolution, decrease emission of the gaseous pollution agents and minimize amount of the wastewater formed.

Thiocarbamide- hydrosulfite-, sulfite-, thiosulfate- and thiocyanate compounds are used regularly in the nitric acid based etching compositions in order to protect the metal surface from its dissolution. However, these compounds are quite toxic and