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# Inhibitive action of Ethylamine and Triethylamine on Corrosion of Zinc in Sulfamic Acid

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**Abstract:**
The measurement of inhibition efficiency of ethylamines on corrosion of zinc in sulfamic acid was carried out by weight loss and potentiodynamic polarization methods. Zinc metal was exposed in sulfamic acid solution and with temperature, increase corrosion rate increases with acid concentration. As increase in temperatures, inhibition efficiency (I.E.) of inhibitor decreases. The inhibition efficiency (I.E.) of ethylamines increases with increase in inhibitors concentration at constant acid concentration. As acid concentration increase I.E. also increases. In present study, triethylamine shows higher I.E. then ethylamine. Maximum I.E. was found 97.5 % for 15 mM triethylamine in 1.0 M acid concentration. The mode of inhibitive action appears to be physiorption following the Langmuir adsorption isotherm. Tafel plots of polarization study indicates that ethylamine and triethylamine act as mixed type inhibitors.

*Key Words*: Corrosion, zinc, sulfamic acid, ethylamine, triethylamine, polarization.

## Introduction

Sulfamic acid ($NH_3O_3S$) is a strong acid and is used as a cleaner for rust, algae and scale from condensers and cooling tower. The problem of corrosion is considerable importance due to increase in uses of metals and alloys. Zinc is one of the most important non-ferrous metals, which finds extensive use in metallic coating. Aromatic, aliphatic and heterocyclic amines have been extensively investigated as corrosion inhibitors [1-3]. Zinc metal dissolves in solution with pH upper than 12.5 and lesser than 6, while between pH 6 to 12.5 the dissolution is very lower[4]. The inhibitive properties of cyclic amines and a series of secondary aliphatic in acid media are controlled by the percentage of $\pi$ - orbital of free electron on the nitrogen atom of these compounds according to Hackerman et al.[5]. Ethylamines were used as corrosion inhibitor for zinc in ($HNO_3$ + HCl) binary acid mixture[6], in phosphoric acid[7], in nitric acid[8], in ($HNO_3 + H_2SO_4$) binary acid mixture[9], in ($HNO_3$+$H_3PO_4$) acid mixture[10] and in sulphuric acid[11]. The present study was undertaken to evaluate ethylamine and triethylamine as corrosion inhibitors for zinc in sulfamic acid.

## Experimental

The test specimens having chemical composition of 0.01% Fe, 0.02% Cd, 0.03% Pb and 98.5% Zn. For the assessment of corrosion rate of zinc, rectangular specimens (5.5 X 2.5 X 0.2 cm) of having an area of 0.3074 $dm^2$ were prepared and all specimens were wrapped in plastic bag after buffing to avoid atmospheric corrosion. Analytical grade sulfamic acid was used as corrosive media having a concentration of 0.1, 0.5, 1.0 M.

To study the effect of corrosion on zinc in sulfamic acid, weight loss method, effect of temperature, potential as well as polarization measurements have been used.