

CORROSION INHIBITORS FOR REINFORCED CONCRETE STRUCTURES

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Abstract : The corrosion of the armatures is one of major causes of damages observed in reinforced concrete structures. The life of these reinforced concrete structures depends on the response to physical and chemical environment, as well as the ability of materials to protect them against diverse attacks. In order to optimize the design and be built stronger and more durable, designers need to know the corrosion process and its environmental and structural interactions. Corrosion will be developed mainly by two processes: the carbonation of concrete and attack by chlorides which, when they are in sufficient quantity in the vicinity of the armature, they generate pitting corrosion. According to the literature several methods have been investigated in order to reduce or to inhibit corrosion of reinforced concrete. Among them, the use of corrosion inhibitors is considered as the most elegant solution. Compounds with functional groups containing hetero-atoms such as nitrogen, oxygen or sulfur can donate lone pairs of electrons are found to be particularly useful as inhibitors of metal corrosion. Aromaticity and electron density at donor atoms are found to influence the adsorption of inhibitor molecules on corroding metal surface. Several researchers studied the effect of heterocyclic organic compounds on corrosion of steel. Schiff bases are well-known organic inhibitors in acidic media. Some research work revealed that the inhibition efficiency of Schiff bases is much greater than that of corresponding amines and aldehydes and attributed this to the presence of an -HC=N- group in the molecule's structure. The aim of our work is to study the inhibitory efficiency of new organic compounds towards corrosion of steel in alkaline solution simulating water pore solution of concrete by cyclic voltammetry. Two Schiff bases derived from dehydroacetic acid were prepared. The chemical structures of Schiff bases were confirmed by using elemental analysis, FTIR and $^1\text{H-NMR}$ spectra. Thus, single crystals were grown and analyzed by X diffraction. The synthesized Schiff bases were evaluated as corrosion inhibitors for low carbon steel in chlorinated medium. The electrochemical parameters showed that these molecules present a greater rate of inhibition at the weak concentrations and for long time of immersion. These inhibitors act by chemical adsorption involving their antilants electronic doublets of oxygen and nitrogen atoms of the molecule's structures. Experimental data were found to follow Langmuir adsorption isotherm. These results were confirmed by MEB spectroscopy. Corrosion measurements conclude that these organic compounds showed high protection against corrosion process of concrete rebar. This conclusion seems to be important and opens perspectives to use Schiff bases as new inhibitors towards corrosion reinforced concrete structures in building.

Keywords : inhibitor, corrosion, Schiff bases, armature, concrete.