Upon a history of erosion-corrosion studies

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Erosion-corrosion is the acceleration or increase in rate of deterioration or attack on a metal because of the relative movement between metal surface and a corrosive fluid [1]. Generally, this movement is quite rapid, and mechanical wear effects or abrasion are involved. Metal is removed from the surface as dissolved ions, or it forms solid corrosion products that are mechanically swept from the metal surface. Compared with corrosion of metallic materials in stagnant corrosive media, it is very serious and has a complex mechanism. Thus, many researchers have paid their attentions to erosion-corrosion since last century. Throughout the studies on erosion-corrosion, their history would be divided into four stages.

Fundamentally, erosion corrosion is one type of flow-induced corrosion. The classification of flow-induced corrosion was made by E.Hetz [2].During this time, the effect of the turbulence of flow liquid on corrosion rates of metals in a flowing medium was firstly focused on and many attempts were made to develop the relationship of Reynolds Number(Re), Sherwood Number (Sh)and Schmidt number(Sc) with corrosion rates[3].

Nextly, with further studying the effect of hydrodynamic factor on erosion-corrosion, it was found that the higher mass transfer coefficient, the higher corrosion rates, and that there is a critical surface shear stress above which erosion corrosion rate increases abruptly [4]. Up to now, the critical velocity has been used to control erosion corrosion of pipes in corrosion control design.

At the third stage, professor Postlethwaite started to use CFD software for studying the effect of the boundary parameters of flow liquids on erosion corrosion [5]. At the same time, there were many attempts to establish the relation of the boundary parameters of flow liquids with erosion-corrosion rates [6]. And that the synergistic effect between hydrodynamic factors and electrochemical factors attracted many attentions [7]. It was worth maintaining that the EIS was used to study the electrochemical process kinetics of a metal in a flowing corrosive fluid [8].

Finally, as said above, there few papers which focused on studying the impact of hydrodynamic factors on the surface layer of metals in a flowing medium. In this case, an attempt was started to investigate the mechanical degradation of the surface layer of metals induced by hydrodynamic factors and the synergistic effect between the mechanical degradation of the surface layer of metals and corrosion [9].

In the future, some attentions should be paid to study the accelerated mechanism of erosion corrosion at an atom scale using some software, including the predict erosion corrosion using machine study methods.

Kew words: Erosion corrosion;flowing fluid;synergistic effect; hydrodynamic;electrochemical factors

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