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Recent Progresss in Tribological behaviors of Nitride Treated Austenitic Stainless Steel-A Review

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Abstract

Austenitic stainless steel has excellent corrosion resistance and, therefore, it is used in chemical, food, medical, nuclear industries, etc. However, when it slides against itself, it exhibits severe metallic wear, surface damage and subsurface plastic deformation because of strong adhesive bonds at the contact junctions. Furthermore, austenitic stainless steel exhibits poor tribological properties. Hence, its surface has to be surface treated properly. The surface modification does not only solve component degradation problems but also can provide added value. Although all kind of coating method is in practice, diffusion coating is widely used and has many advantages as follows: (1) coating adhesion strength is very high, (2) fine surface structure can be obtained, (3) there is no or negligible amount of dimensional changes occur, (4) diffuse coated components can be directly used, (5) coating retains the basic property of bulk material. Hence, in this paper, a detailed review has been done on nitride treated stainless steel and its tribological properties are discussed.

Keywords: Stainless Steel, Nitride treatments, Optimum process parameters, Tribologicalbehaviors, Elevated temperature, Vacuum

1. Introduction

1.1. Tribology

The word tribology is defined as the science and technology of interacting surfaces which are in sliding and/or rolling motion [1, 2]. It has three major parts (a) Friction (b) Wear and (c) Lubrication. Many failures of metals occur more due to tribological problem than to mechanical problems such as fracture, plastic deformation and fatigue.

1.2 Friction

It is defined as resistance encountered when one body moves (either sliding or rolling) tangentially over another [3]. This resistance force acts opposite to its motion and it is called friction force. The ratio of friction force (F) to normal load (W) is called Co efficient of Friction (COF) and denoted as 'μ' (Fig. 1). Generally, when two clean surfaces (without any oxide films and adsorbates) are contacted, it exhibits very high friction [3]. The COF varies from 0.001 (for light loaded rolling bearing) to greater than 10 (clean metal sliding against itself in vacuum environment) [1].