PO2079

Effect of screen open area on active screen plasma nitriding response

Akio Nishimoto[1], Tatsuya Matsukawa[2], Hiroaki Nii[2]

[1]Kansai University, Osaka, Japan [2]Graduate School of Science and Engineering, Kansai University, Osaka, Japan

akionisi@kansai-u.ac.jp

The nitriding process is widely used to improve the tribological properties and wear resistance of steels and titanium alloys. The components to be treated are subjected to a high cathodic potential to produce plasma directly on their surfaces in the plasma nitriding. An “edging effect” occurs due to distortions of the electric field around the corners and edges of the components although the components are well heated. This results in nonuniformity in properties such as the hardness and thickness of the surface layer. Recently, there has been considerable interest in active-screen plasma nitriding (ASPN). In this process, the edging effect is completely eliminated because the plasma is produced on the cage and not directly on the samples. In this study, an austenitic stainless steel SUS 316L was nitrided by ASPN using various screens with different open areas to investigate the effect of the open area ratio of screen on the nitriding responses.
ASPN experiments were carried out using a DC plasma-nitriding unit. The sample was placed on the sample stage in a floating potential and isolated from the cathodic screen and the anode. The screen, which was SUS 316L expanded metal with 38%, 48% or 63% open area ratio, was mounted on the cathodic stage around the sample stage. Nitriding treatment was performed in a nitrogen-hydrogen atmosphere with 25% N2 + 75% H2 for 18 ks at 693 K under 600 Pa by the ASPN process. After nitriding, the nitrided microstructure was examined with a scanning electron microscope (SEM). The phase structures on the nitrided surface were determined by X-ray diffraction (XRD) studies. In addition, the hardness of the surface and the cross sections of the nitrided sample were measured using a Vickers microhardness tester. The thickness of the nitrided layer of S phase decreased with increasing open area ratio of the screen.

Keywords
active screen plasma nitriding
open area ratio
surface engineering
stainless steel
sputtering