Improvement of Contact-fatigue Properties of High-strength Low-alloy Steel by Hybrid Technologies Combining Vacuum Carbonitriding and Diamond-like-carbon-film Coating

Performance Evaluation of Water-based Electromagnetic Shielding Paint

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Abstract

With the aim of fabricating power-train gears and rolling-sliding parts with high functionality (such as both high contact-fatigue strength and excellent tribological characteristics), a hybrid surface-modification technique with a combination of vacuum carbonitriding and a diamond-like-carbon (DLC) film coating was investigated by using high-strength low-alloy steel designed for carbonitriding to high nitrogen content. The results of a two-cylinder-type roller-pitting fatigue test show that each of a DLC film (deposited by linear-ion-source; LIS method), a silicon-doped DLC film coating and nitrogen implantation (performed by plasma-based ion implantation; PBII, and deposition; PBIID methods) improve the pitting endurance of the high-strength steel vacuum carbonitrided with a nitrogen content of 0.41-0.55 mass%, especially under a Hertz's pressure (Pmax) of more than 4.2 GPa. As for the effect of the LIS-DLC film coating on pitting endurance, for example, improving the pitting lifetime sixfold at Pmax of 4.2 GPa can be explained by a 17% decrease in friction coefficient due to the film coating.

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