Jurnal Tribologi • Volume 36, Pages 57 - 69 • March 2023

Document type
Article

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Journal

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Morphological and wear behavior of low temperature thermochemical gaseous nitriding process

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Abstract

In this study, the nitride layer based on incorporation of nitrogen diffusion via low temperature thermochemical nitriding process were prepared. Nitriding temperature, holding time and gas flow rate during nitriding process were used as the parameters to assess morphology and wear behavior. Nitriding holding time was varying for 4, 8 and 12 hours, meanwhile temperature and glass flow rate were keeping constant. The thickness and hardness of nitride layer varied with the holding time with the thickest layer of 60.5 µm and surface hardness of 513.3 $HV_{0.5}$. The nitride layers, containing expanded austenite, Fe_3N and CrN phases were developed during low temperature thermochemical gas nitriding process. The expanded austenite formation on the nitride layers demonstrates that the best wear behavior is due to the highest hardness. The wear rate improved to 40 % and CoF to 23 % as compared to untreated DSS, respectively. Furthermore, it was revealed that the worn surface showed a mild ploughing and striation of wear for the nitrided samples compared to untreated DSS which demonstrated ploughing and deeper grooves. It was demonstrated that nitriding process is capable and feasible to produce hard surface layer on DSS with higher hardness and wear resistance properties.

Author keywords
Hardness; Morphological; Nitriding; Thermochemical; Wear resistance

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