



Mechanical properties of nitrated layer after laser modification.

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ABSTRACT

The aim of this work was to study the microstructure and friction coefficient of hybrid surface layers, produced by a controlled gas nitriding and laser modification. Nitriding is well-known method of thermo-chemical treatment, applied in order to produce surface layers of improved hardness and wear resistance. The phase composition and growth kinetics of the diffusion layer can be controlled using a gas nitriding with changeable nitriding potential. 42CrMo4 steel was treated by composite technology of gas nitriding and laser hardening. The nitriding processes were performed at temperature 580 °C and longer time 8h. Next, the nitrated layer was laser-modified using laser TRUMPF TruDiode 3006 which maximal power is 3 kW. Using the two laser beam powers (P): 0.53 kW and 0.62 kW. Then the microstructure and properties of the composite modified layer were investigated using optical microscopy, Vickers hardness tester and friction wear testing machine. The nitride layer was subjected to wear tests using a ball-on-disc experiment. The modified nitrated layer was tested for wear resistance at room temperature. The results show that the composite modified layer mainly consists of α -Fe phases. Laser hardening can effectively increase the depth of the hardening layer. The layer after modification laser heat treatment were good friction coefficient. The curve of the friction coefficient after the nitrated layer was characterized by large fluctuations. Compared with nitriding technology, the hybrid treatment technology can effectively increase the hardness and wear resistance of the 42CrMo4 steel surface.

Keywords: nitriding; laser heat treatment; microstructure; wear resistance; microhardness