

Damage in Thermal-Sprayed WC-Co Coatings by Repeated Load

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Abstract

Two types of WC-12wt%Co powders, each manufactured by a different process, were thermally sprayed on a medium carbon steel by HVOF, and repeated load tests (rolling contact fatigue test and high cycles fatigue test) were carried out. The surface damages for the two types of coatings were investigated. It has been clear that the coating damages depend on the types of powders. It has been found that in rolling contact fatigue, there are the coatings, in which damage is characterized by delamination, and by a mixture of delamination and cracks. And it has also been found that in high cycles fatigue, there are the coatings, in which damage is characterized by net-like fatigue cracks, and by linear fatigue cracks.

SINCE SPRAYED TUNGSTEN CARBIDE TYPE COATINGS BY HVOF offer some good properties of high density and high hardness, they are being applied to the parts under repeated load, such as rolling contact fatigue, high and low cycles fatigues, etc. However, there is a lack of report on damages of deposited WC type coating under repeated load.

Generally there are many cases that damages occur at the surface of specimens, which results in fracture. Therefore, it is necessary to investigate the surface damages of coatings under repeated load in detail. However, there are only a few reports on rolling contact fatigue (Ref 1-4), and

fewer reports on high and low cyclic fatigue (Ref 5-9).

The lack of the information has become one of the barriers to design coating materials for bearing repeated load, and this is considered to be a reason resulting in being late in developing a method to prevent the damages.

This investigation aimed at applying WC types sprayed coatings by HVOF to the parts of the soft metals under a repeated load.

A medium carbon steel was used as substrate material. Two types of spray powders with the same composition, each manufactured by a different process, were selected, and were sprayed on the substrate by HVOF. The repeated load tests were two types, i.e., rolling contact fatigue test and high cycles fatigue test. The rolling contact fatigue test was carried out in groups of the same coatings, and both the macro-damage and the micro-damage on the surface of the specimens under repeated load were examined. The high cycles fatigue test was conducted for the two types of coatings. Then the fatigue cracks occurred in the coatings were examined, and whose relations to the damages under the rolling contact fatigue were studied.