

THE PROBLEMS OF PRECISION IN TRIBOLOGICAL TESTING OF PVD COATINGS

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In the tribological testing the achievement of satisfactory comparability of results (i.e. reproducible results) obtained at various laboratories is a difficult problem. This comes from the fact that results of tribological testing - in case of bulk materials - are affected by test conditions such as: the kind of motion (sliding, rolling etc.), air relative humidity, ambient temperature, sliding speed, load and tribosystem vibrations.

In the tribological testing of thin engineering coatings the situation is more complicated for the reason of an influence of additional factors on obtained results. These factors are for example: the substrate hardness, roughness and coating thickness.

Unfortunately, the existing standards like ASTM G 99-90 or DIN 50324, concerning tests using a pin-on-disk or ball-on-disk tribosystem, do not precise all of the above mentioned factors. These standards advise only the kind of motion (sliding), and suggest the range of rotational speeds, pin (ball) diameters and general requirements referring to the construction of the tester loading unit to reduce vibrations.

Hence, within the framework of the COST Action 516 project and on the base of own experience gained during the realisation of the VAMAS TWA1 project, the authors have elaborated a method for tribological testing of thin engineering coatings.

As a tribosystem the authors chose the unlubricated ball-on-disk couple. The investigated PVD coatings were deposited on the steel disk. The Al₂O₃ ball was pressed against the disk rotating in the horizontal plane. The following parameters were precisely defined: the ball diameter, wear track radius, air relative humidity, ambient temperature, sliding speed, load and - additionally to other methods - substrate hardness, roughness and coating thickness.

Since the test results shown that the presence of wear debris in the contact zone made tribological characteristics unstable and increased the scatter of results, the new test method assumes the wear debris removal, realised through the stream of dry argon.

The verification tests of the new method have proved its suitability for investigation of tribological properties of various PVD coatings.