УДК 811.111. + 533.9.

STUDYING THE INTERACTION OF LASER RADIATION WITH MATERIALS COVERED BY ION-PLASMA DEPOSITION

Шеракажуков М.В.
Научный руководитель Ткачёва Н.А.
Сибирский федеральный университет

In the report the study of the interaction of the laser radiation with coatings sputter materials is considered.

Studying the interaction of the laser radiation with the materials covered by the ion-plasma deposition is of particular importance in modern materials handling.

Thermal spraying techniques are such coating processes in which melted (or heated) materials are sprayed onto a surface.

There are several variations of thermal spraying:

- Detonation spraying,
- Wire arc spraying,
- Flame spraying,
- High velocity oxy-fuel coating spraying,
- Warm spraying,
- Cold spraying.

Thermal spraying can provide thick coatings (approx. thickness range is from 20 micrometers to several mm depending on the process and feedstock), over a large area at high deposition. Coating materials available for thermal spraying include metals, alloys, ceramics, plastics and composites. In plasma spraying process, the material to be deposited (feedstock) — typically as a powder, sometimes as a liquid, suspension or wire — is introduced into the plasma jet, emanating from a plasma torch. In the jet, where the temperature is about 10,000 K, the material is melted and propelled towards a substrate. There, the molten droplets flatten, rapidly solidify and form a deposit. The resulting coatings are made by the accumulation of numerous sprayed particles. The surface may not be heated significantly allowing the coating of flammable substances.

The coating quality is usually assessed by measuring its porosity, oxide content, macro- and micro-hardness, bond strength and surface roughness. Generally, the coating quality increases with the increase of particle velocities.

Laser is a device which generates coherent radiation. To study the interaction of ion-plasma coating with a laser beam the carbon dioxide laser is used. The carbon dioxide laser generates a beam of infrared light with the principal wavelength bands centering around 9.4 and 10.6 micrometers. The carbon dioxide lasers are the highest-power continuous wave lasers that are currently available. The study was conducted at the Institute of Physics.

Some characteristics of the laser were:
Max. Power = 20 W;
Max. Velocity = 2 m/s;

Some characteristics of the ion-plasma deposition were as follows:
Thickness = 0.39 mkm;
The main material was plastic.
Brass was used as the deposited layer.

The research has been carried out to show the dependence of the deposited layer thickness on the laser radiation. The results are given in Fig.1.

Table 1 demonstrates the results in more accurate and informative way.

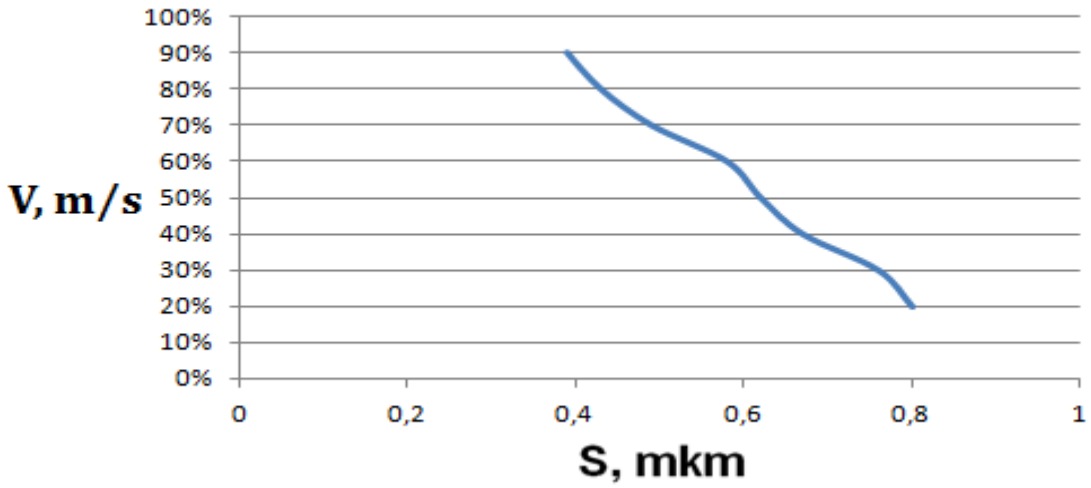

Fig.1 The dependence of the deposited layer thickness on the laser radiation

S, mkm	V, m/s
0,8	20%
0,76	30%
0,67	40%
0,62	50%
0,58	60%
0,49	70%
0,43	80%
0,39	90%

Table 1. The dependence of the deposited layer thickness on the laser radiation in more accurate and informative way.

In the report this research will be presented more detailed.

In conclusion it's worth mentioning that such experiments were performed for the first time, the research being a particular case of the laser application.