

Influence of nanosecond laser pulses on physico-chemical properties of metal surface for various wetting applications

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One of the promising applications of nanosecond laser pulsed processing is the control of surface wettability. Surface irradiation with laser power density starting from 170 MW/cm² initiates the appearance of solidified splashes of molten metal at the edges of the formed spot. A dependence was obtained showing that with an increase in the power density and overlapping of laser pulses, there is a tendency to a decrease in the contact angle. Measurements of the surface roughness of the samples, as well as the X-ray diffraction analysis of the phase composition of the samples showed that with an increase in the processing temperature, new hydrophilic metal oxides were formed, and the surface roughness also increased, which, in accordance with the Wenzel equation, leads to hydrophilicity.

The combination of areas with different wetting allows the formation of a wetting gradient which has a wide range of applications and can be used in studying bimolecular interactions or for creating chemical sensors. Hydrophilic surfaces are widely used in to improve the adhesion of biocells that especially important in early stage of implants biointegration.

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