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Surface Modification with Atmospheric Microwave Agron Plasma Jet Assisted with Admixture of H2O2 and Analysis of Plasma Characteristics

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Recently, low-temperature atmospheric-pressure plasmas have been investigated [1,2] for biomedical applications and surface treatments. Experiments for improving hydrophilicity of stainless steel (SUS 304) plate with atmospheric microwave argon and H2O2 mixture plasma jet [3] were carried out and experimental measurements and plasma simulations were conducted for investigating the characteristics of plasma for the process. After 30 s of low power (under 10 W) and low temperature (under 50^{o}C) plasma treatment, the water contact angle decreased rapidly to around 10^{o} from 75^{o} and was maintained under 30^{o} for a day (24 hours). The surface free energy, calculated from the contact angles, increased. The chemical properties of the surface were examined by X-ray Photoelectron Spectroscopy (XPS) and the surface morphology and roughness were examined by Scanning Electron Microscopy (SEM) and Atomic Force Microscopy (AFM) respectively. The characteristics of plasma sources with several frequencies were investigated by Optical Emission Spectroscopy (OES) measurement and one-dimensional Particle-in-Cell (PIC) simulation and zero-dimensional global simulation [4]. The relation between plasma components and the efficacy of the surface modification were discussed.

References

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