

Accepted Manuscript

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PII: S0257-8972(17)30461-9
DOI: doi: [10.1016/j.surfcoat.2017.05.005](https://doi.org/10.1016/j.surfcoat.2017.05.005)
Reference: SCT 22324
To appear in: *Surface & Coatings Technology*
Received date: 15 February 2017
Revised date: 12 April 2017
Accepted date: 2 May 2017

Please cite this article as: Xuan Yang, Lin Chen, Yao Qu, Run Liu, Kejian Wei, Wenbin Xue , Optical emission spectroscopy of plasma electrolytic oxidation process on 7075 aluminum alloy, *Surface & Coatings Technology* (2017), doi: [10.1016/j.surfcoat.2017.05.005](https://doi.org/10.1016/j.surfcoat.2017.05.005)

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Optical Emission Spectroscopy of Plasma Electrolytic Oxidation Process on 7075 Aluminum Alloy

Xuan Yang^{a,b}, Lin Chen^{a,b}, Yao Qu^{a,b}, Run Liu^c, Kejian Wei^{a,b}, Wenbin Xue^{a,b*}

^aKey Laboratory for Beam Technology and Materials Modification of Ministry of Education, College of Nuclear Science and Technology, Beijing Normal University, Beijing 100875, China

^bBeijing Radiation Center, Beijing 100875, China

^cZhenjiang Watercraft College, Zhenjiang 212000, Jiangsu, China

Abstract: Plasma electrolytic oxidation (PEO) on 7075 Al-Zn-Mg-Cu alloy was performed to produce the ceramic coatings in silicate electrolyte at constant voltage. The plasma electron temperature, electron density and atomic ionization degree in plasma zone were evaluated by analyzing the spectral lines of optical emission spectroscopy (OES), and the high spike peaks on plasma temperature profiles were emphatically discussed. The average electron temperature in plasma zone was about 3000K - 15000K, and the electron density was about $4.95 \times 10^{21} \text{ m}^{-3}$ - $1.65 \times 10^{22} \text{ m}^{-3}$, meanwhile the atomic ionization degree of Al was less than 10^{-3} , while the temperature inside the alloy is below 120°C. It was believed that the high spike peaks on plasma temperature profiles appeared in the later stage of PEO process resulted from the calculation deviation of plasma temperature from weak OES spectral line intensities. The generation of these spike peaks depended on the spark density and illumination intensity rather than the appearance of large discharge sparks, which was

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