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PEO coatings for Additively Manufactured AlSi7Mg0.6 alloy: Unveiling the influence of surface morphology

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Additive manufacturing (AM) has revolutionized metal production, particularly for lightweight alloys such as aluminum alloys. However, the AM process produces microstructures that differ significantly from those formed through conventional processing techniques, which has a profound impact on their corrosion resistance. To enhance the corrosion resistance of AlSi7Mg0.6 alloy produced via Selective Laser Melting (SLM), Plasma Electrolytic Oxidation (PEO) coatings were developed. This study investigates the influence of various surface morphologies on corrosion resistance, achieved through chemical and mechanical surface treatments prior to PEO coating. Electrochemical examination, including Scanning Vibrating Electrode Technique (SVET) and Electrochemical Impedance Spectroscopy (EIS), revealed the critical role of surface condition in determining PEO coating protectiveness. Furthermore, field emission scanning electron microscopy (FESEM) conducted before and after immersion in a simulated aggressive electrolyte highlighted the significant impact of AM surface preparation on PEO performance.