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METHODS FOR PRODUCING ELECTROCHEMICAL COATINGS ON METALS

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To enhance the physicochemical and mechanical properties of metals, surface coatings are applied to extend their functionality. Among the most common techniques are electrochemical technologies, including plasma spraying; micro-arc oxidation; coating crystallization from solution; detonation gas spraying; electrochemical deposition and the sol-gel processing. Each method has distinct advantages and limitations.

One of the most promising coating techniques for valve metals (Ti, Nb, Ta, Al, Zr, Hf, W, Bi, Sb, Mg) is micro-arc oxidation (MAO), also known as plasma electrolytic oxidation (PEO).

The defining feature of MAO is the generation of numerous micro-discharges within the electrolyte. These discharges penetrate the growing oxide layer; induce localized melting; trigger recrystallization, resulting in homogeneous coatings with tailored mechanical properties.

The primary limitation of MAO for producing wear- and corrosion-resistant coatings on titanium alloys is the extended process duration (90-150 minutes). However, this method offers significant advantages, including the ability to obtain coatings with:

- High mechanical strength
- Uniform microstructure
- Controlled phase composition [1].

REFERENCE

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