

# Industrial Wastes used as Ceramic Coating on Aluminum Alloy for Engineering Applications

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**1. Introduction** – Industrial Wastes can be a valuable source of raw material for new processes but often end up being disposed of unused. In this scenario, it is worth mentioning two residues produced by Brazilian industries: Kaolin Waste and Waste Foundry Sands (WFS). These Wastes are generally disposed in dam or industrial landfills, which occupy large areas and requiring constant monitoring to prevent environmental damage. However they have propitious chemical composition for use as protective coating on metals. The protection of metallic surface is a subject of great scientific and economic interest, and it can be obtained by different surface treatments techniques. This work evaluates the feasibility of using these residues to obtain coatings in aluminum alloy by Electrolytic Oxidation by Plasma (PEO) [1], characterizing the coatings obtained and identifying possible applications in engineering areas.

**2. Experimental** – Depositions on 5052 aluminum alloy substrates with treatment time of 10 minutes were obtained for two different electrolytic solutions: 5 g/L kaolin waste and 5g/L of WFS. The mineralogical composition of coatings was investigated by X-Ray diffraction (XRD). The morphology and thickness were observed using a Scanning Electron Microscopy (SEM). Surface wettability was determined by contact angle.

**3. Results and Discussion** - The morphology of the coatings, obtained using both residues, presents pores and numerous coalesced structures (Image 1). The thicknesses of coating are present in Table I. The coating obtained with Kaolin waste are hydrophobic whereas those obtained with WFS are hydrophilic. Aluminium, iron and siliceous oxides are the main components of the. Alumina and mullite are the main phases observed by XRD on Kaolin waste coating and alumina and moissanite on WFR coating. These crystalline structures provide the formation of a ceramic layer, with good chemical stability and great thermal resistance.

**Table I.** Ceramic Coating Thickness.

Waste	Thickness ( $\mu\text{m}$ )
Kaolin waste	8.25
WFS	4.91

**4. Conclusions** – The results demonstrate that it is feasible to use these industrial residues to obtain ceramic coatings in aluminum alloy by PEO. The ceramic coatings obtained have features which may allow them to be used in applications requiring good chemical and thermal stability and may improve the mechanical wear of the surfaces.

## 5. References

[1] A.L. Yerokhin et al. *Surf. Coat. Technol.*, **199**, (2005) p. 150.