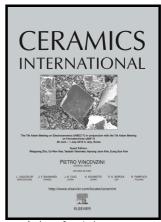
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ACCEPTED MANUSCRIPT

Structure and electrical insulation characteristics of

plasma-sprayed alumina coatings under pressure

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Abstract

In this work, alumina coatings were fabricated on 316LN austenitic stainless

steel by a plasma spray technique. The pressure dependence of the surface electrical

resistivity of alumina coatings was investigated in detail. A combination of scanning

electron microscopy and X-ray diffraction was employed to understand the

microstructure and properties of the as-sprayed alumina coatings. The coatings can

endure high pressures under a practical working environment. The surface electrical

resistivity of the alumina coatings decreases continuously with an increase in pressure

to 250 MPa. Interestingly, the surface resistivity is still greater than $10^7 \,\Omega$ mm for 250

MPa, demonstrating that the coatings have good electrical insulation properties and

can be fully utilized in the magnet support of ITER.

Keywords: Alumina coatings; Surface resistivity; Crystal structure; X-ray techniques

1 Introduction

Conductors can give rise to a large eddy current in International Thermonuclear

Experimental Reactor (ITER) magnet supports due to the presence of self-resistance.

The insulation coatings can withstand the high force, strong magnetic field and

cryogenic temperature that occur during operation, so outstanding electrical insulation

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