

Al₂O₃ COATINGS

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Alumina coatings, with the chemical symbol Al₂O₃, can be electrically insulating, chemically inert, very wear-resistant, and stable at elevated temperatures, depending on the crystalline phase and the deposition temperature. Since not all substrates tolerate a high process temperature, both a low and a high temperature version of Al₂O₃ have been developed. If needed, the Al₂O₃ coating may be combined with a TiAlN binding layer, which is converted into the Al₂O₃ coating. This combination results in an improved adhesion to the substrate facilitated by the TiAlN adhesion layer.

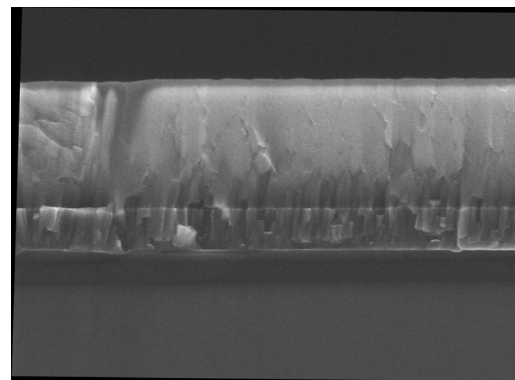
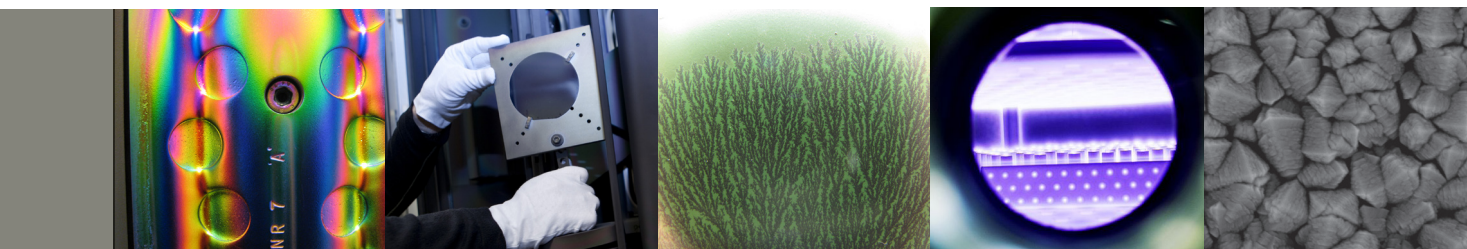


Fig. 1: Cross-sectional SEM image of Al₂O₃/TiAlN

PROPERTIES

Low-temperature LT-Al ₂ O ₃	
Deposition temperature	~250 °C
Hardness	9-11 GPa
Thickness	E.g. from 4-6 µm
Structure	Amorphous
Chemical stability	Not stable in alkaline solutions
Good electrically insulating properties	

High-temperature HT-Al ₂ O ₃	
Deposition temperature	~530 °C
Hardness	19-21 GPa
Thickness	E.g. from 1-3 µm
Structure	Gamma Al ₂ O ₃
Chemical stability	High
Good electrically insulating properties and high wear resistance	



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BINDING LAYER

Alumina coatings can be supplied with and without a binding layer on electrically conducting substrates as well as on insulating substrates.

APPLICATIONS

Al₂O₃ coatings are well suited as electrical insulators – especially in applications where electric insulation is needed in a sliding configuration. Other application areas could be sealing faces moved relative to each other or in connection with valve seats. Alumina coatings are also known to have non-stick properties towards various liquids and melted metals due to hydrophobic surface properties.

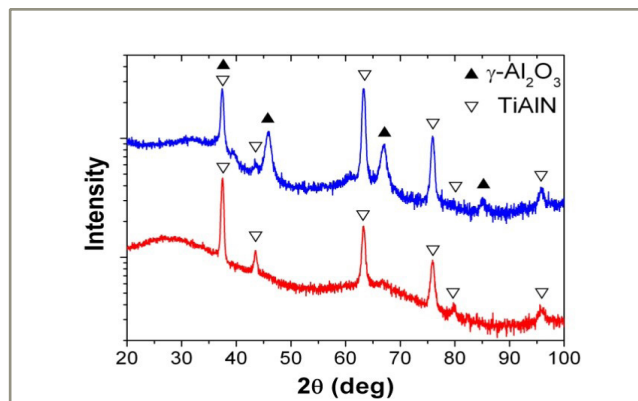


Fig. 2: XRD patterns of high temperature (blue) and low temperature (red) Al₂O₃ / TiAlN coatings