

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.

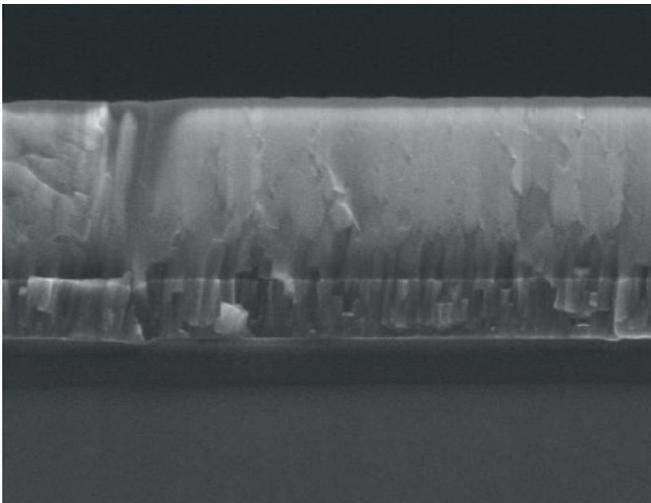


Figure 1:
Cross-sectional SEM image of Al₂O₃ / TiAlN

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.

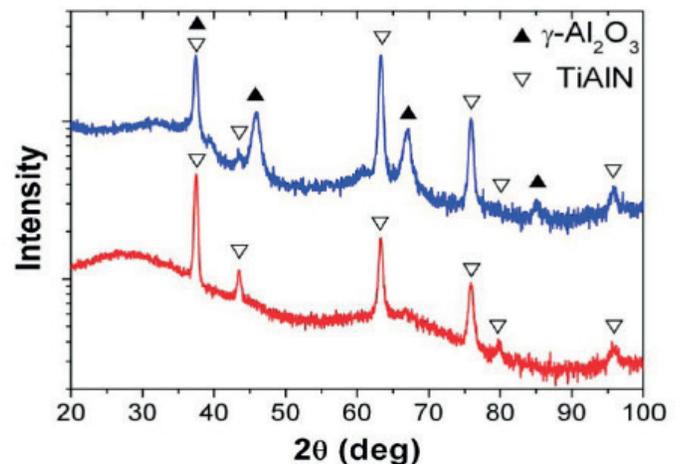


Figure 2:
XRD patterns of high temperature (blue) and low temperature (red) Al₂O₃ / TiAlN coatings

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Properties

Low-temperature LT- Al_2O_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_2O_3	
Deposition temperature	~530 °C
Hardness	19-21 GPa
Thickness	E.g. from 1-3 μm
Structure	Gamma Al_2O_3
Chemical stability	High
Good electrically insulating properties and high wear resistance	

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