

COATING ICM-OXIDE FIBRES IN A BUNDLE BY METAL AND COMPOUND LAYERS

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SUMMARY : Versatility of oxide fibre produced by the internal crystallization method (ICM)¹ can be greatly enhanced by applying various coatings on the fibre to control the fibre/matrix interface in composites. Since various matrices need to interact with the fibre in various ways, a variety of the necessary coatings range from pure metals, such as molybdenum, to complex oxides, such as magnetoplumbites is necessary to satisfy requirements of composite technology. Hence, a variety of the coating methods should be used including CVD, sol-gel, etc. A peculiarity of the ICM-fibres is that they do not exist as continuous filaments, so the methods developed for continuous fibres are not directly suitable for ICM-fibres. Technical modifications of the known methods adjusting them to fibres bound into a carcass shall be described in the present paper. Also microstructure and some properties of the coatings are to be presented.

KEYWORDS: oxide fibres, molybdenum coating, oxide coatings, CVD, sol-gel, internal crystallization

CVD PROCESSES FOR METAL AND NON-OXIDE COATINGS

Molybdenum and tungsten coatings can be useful to ease infiltrating nickel-based melts into the fibre bundle. To coat oxide fibres in a bundle with molybdenum, chemical reactions involving either molybdenum pentachloride or molybdenum carbonyl were used. A result is shown in *Fig. 1*.

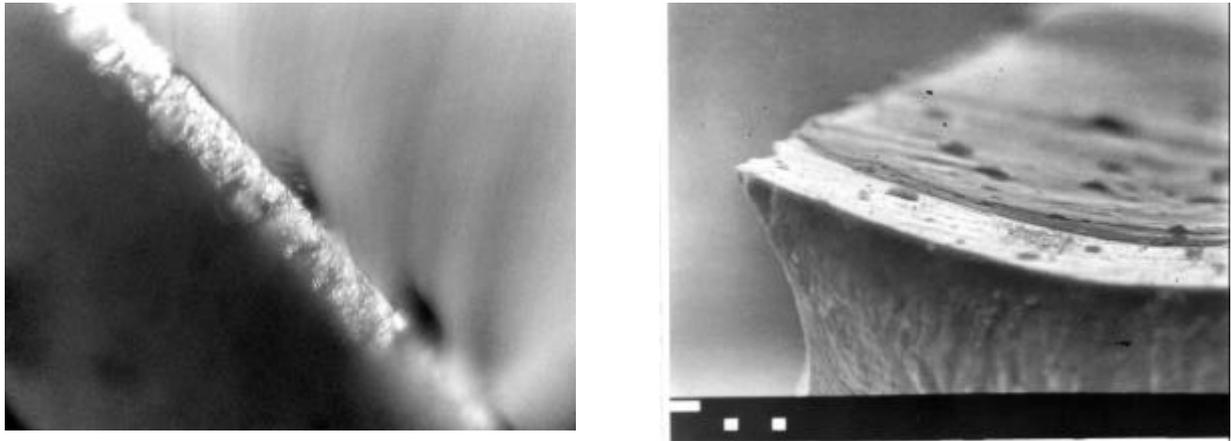


Fig. 1. (a) Molybdenum coating on an ICM oxide fibre obtained in the CVD-process based on a chemical reaction that involves molybdenum carbonyl. Coating thickness is 10 μm .
 (b) Scanning electron micrograph of AlN-coating on a broken end of the $\text{Al}_2\text{O}_3\text{-Al}_5\text{Y}_3\text{O}_{12}$ eutectic fibre. Scale bar = 10 μm .

Also by using CVD coating fibres with AlN (Fig. 1), SiC and $\text{SiC}_x\text{O}_{1-x}$ were obtained to effect the fibre/matrix interface in composites with intermetallic matrices. In all the cases special precautions were taken to organize a homogeneous coating of the fibres in a bundle.

OXIDE COATINGS

Such oxides as aluminium phosphates, vanadates, molybdates, etc., as well as mica-like magnetoplumbites have been studied during the last decade as possible coatings to organize a weak interface in ceramic based composites.^{2,3} Again, a possibility to coat ICM-fibres in a bundle with such oxide was checked by using chemical methods mentioned in the above-cited sources.

Preliminary results of push-out tests performed on oxide/oxide composites containing oxide interface are also presented.

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¹ Mileiko, S.T., Oxide fibres produced by internal crystallization method and their usage in composite technology, submitted to ICCM-12.

² Cinibulk, M.K. and Hay, R.S., Textured magnetoplumbite fibre-matrix interface derived from sol-gel coatings, J. Amer. Ceram. Soc. **79** (1996) 1233 - 1246.

³ ??? in *Advanced Multilayered and Fibre-Reinforced Composites, Proc. of NATO Advance Res. Workshop*, Kiev, Ukraine, June, 1997, Kluwer Academic Publishers, Dordrecht, 1998, 333-352.