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C15.1 Composites

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Réactivité matrice/renfort lors de l'élaboration des composites à matrice métalliques

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Votre résumé :

In the general context of structural lightening in the aerospace industry, Metal Matrix Composites (MMC) materials have attracted much interest over the past decades because of their high specific mechanical properties (relative to density) compared to existing metallic alloys. Of the fibers or particulate materials used as reinforcement for Ti-based composites, titanium carbide (TiC) has been widely investigated because of its excellent chemical compatibility with several type of matrix alloys.

Powder metallurgy route is the most widely used technic for synthesis MMC materials. Whatever the nature of the matrix alloy, a high temperature treatment is necessary in association with the final consolidation step to ensure full densification of the material. During such high temperature treatment, chemical exchanges between matrix and the TiC particles used as reinforcement could occur with some significant and even drastic impact on the final properties of the composite.

In this presentation, the case of Fe and Ti metal matrix composites reinforced by TiC particles will be reviewed. The nature of the exchanges and or reactions between matrix and reinforcement has been studied from the thermodynamic point of view. Moreover some kinetics aspects have also been experimentally studied, including in-situ diffraction at ESRF. Finally, in the specific case of Ti matrix a complete thermo-kinetic modelling of interaction is proposed, allowing prediction of some important microstructural parameters during the high temperature heat treatment step.

Mots clés : matériaux composites à matrice métallique, Réactivité, Thermodynamique, Titane

Conflits d'intérêts : None Declared