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PROCESSING AND CHARACTERIZATION OF ALUMINUM METAL MATRIX COMPOSITES: AN OVERVIEW

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“A significant increase in the development of light metal matrix composites has been achieved in recent years, so that they could be introduced into the most important applications. AMMCs are attractive in various applications because of their improved physical and mechanical properties. Generally, physical and mechanical properties are more often determined by the fabrication technique. Types of the fabrication process and particle size are the effective factors influencing the physical and mechanical properties of the composites [1]. Continuous fiber reinforced MMCs are expensive and their applications are therefore limited to some extent. But discontinuously reinforced MMCs results in improved properties such as both mechanical and physical that cannot be achieved using conventional engineering alloys [2]. These enhanced material properties are because of the interaction between the metallic matrix and the reinforcement. Less interfacial attraction between the matrix and reinforcement causes the damage to the matrix material. Improved processing and coating techniques can be used to control destructive matrices and the reinforcement interactions. The application of pressure can be used to impel close contact between fiber and matrix and thus promote wetting; squeeze casting is one such example for this. Commonly used processing methods for the processing of AMMC are, Solid-state processes, In situ processes, and Spray-forming of particulate AMMCs, etc. A wide variety of metal matrices and control of fiber orientation and volume fraction can be very easily achieved using solid state technique. But the process is expensive because of long time, high processing temperatures and pressures, and a limitation on the complexity of shapes that can be produced. Hülya Kaftelen et al. [3] studied the structure properties of reinforced composites. And they found no evidence of any interfacial reaction products between Al and TiC reinforcements. Peng et al. [4] claim that modified squeeze casting,

provides an uniform distribution of reinforcement, and high elastic modulus compare to conventional method of composites. Tong et al. [5] found that spray-forming of particulate AMMCs is generally automated and quite the fastest method of producing composite materials. And they suggested that, properties of the composite depend on the interface region, as the interface discontinuity is due to one or more material parameters. The disadvantage of this process is quite expensive. The liquid metallurgy technique is the most significant and economical of all the available techniques in production of AMMCs [6]. The processing of materials in liquid form is commonly known as casting. The conventional method of casting MMCs experiences various problems like mixing of reinforcement, porosity, voids which may leads to decrease in strength and hardness of the composites. Recent developments in the fabrication of AMMCs like stir casting, Squeeze casting, Spray deposition; ultrasonic assisted castings, and reactive are the various liquid state processing methods. Stir casting is the most significant and fastest method for the production of aluminum matrix composites to fulfill the need of material requirements in various fields of applications [7]. The aim of this report is to critically review the different processing techniques used to obtain aluminium metal matrix composites.”

- 1) Segundo o texto, o que significa a sigla: AMMCs? (10%)
- 2) Citar os dois tipos de reforços, mencionados no texto, utilizados nesses compósitos. (10%)
- 3) Traduza para a língua portuguesa a seguinte parte do texto: “Hülya Kaftelen et al. [3] studied the structure properties of reinforced composites. And they found no evidence of any interfacial reaction products between Al and TiC reinforcements.” Segundo relatos do texto, a conclusão de Hülya Kaftelen et al. [3] é boa ou ruim? Justifique a sua resposta em no máximo 5 linhas. (20%)
- 4) Citar, especificamente, dois tipos de propriedades mecânicas desses compósitos mencionadas no texto. (20%)
- 5) Citar uma vantagem e uma desvantagem dos processos de fabricação desses compósitos por fundição e moldagem por spray mencionadas no texto. (20%)

6) Considerando que aplicações aeroespaciais exigem materiais com baixa densidade e elevadas propriedades mecânicas, esses compósitos poderiam ser considerados para esse fim? Justifique a sua resposta em no máximo 3 linhas. (20%)