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Antimicrobial Activity of MgB_2 Powders Produced via Reactive Liquid Infiltration Method

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Abstract: We report for the first time on the antimicrobial activity of MgB_2 powders produced via the Reactive Liquid Infiltration (RLI) process. Samples with MgB_2 wt.% ranging from 2% to 99% were obtained and characterized, observing different levels of grain aggregation and of impurity phases. Their antimicrobial activity was tested against *Staphylococcus aureus* ATCC BAA 1026, *Enterococcus faecalis* ATCC 29212, *Escherichia coli* ATCC 25922, *Pseudomonas aeruginosa* ATCC 27853, and *Candida albicans* ATCC 10231. A general correlation is observed between the antibacterial activity and the MgB_2 wt.%, but the sample microstructure also appears to be very important. RLI-MgB_2 powders show better performances compared to commercial powders against microbial strains in the planktonic form, and their activity against biofilms is also very similar.

Keywords: MgB_2; reactive liquid infiltration method; antimicrobial activity; biofilms

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1. Introduction

Since the discovery of its superconducting properties [1], MgB_2 has attracted a lot of interest both from the theoretical [2–4], and from the practical point of view, with many applications that have been explored and sometimes commercially developed and delivered to the market [5–10]. Preparation methods for this material span a large variety of different techniques [11–23], and among them the Reactive Liquid Infiltration (RLI) method has proved to be suitable to produce objects with complex shapes, high density and good superconducting characteristics [24–26]. More recently, new interest in MgB_2 has been sparked by its unexpected application to the completely different field of biomaterials, which started with the first report by Batalu et al. [27]. For instance, MgB_2 in the form of nanosheets has shown promising results about the possibility to induce hydrogen release at targeted gastric cancer cells, paving the way for a novel hydrogenochemotherapy of digestive tumors that is expected to have high efficacy and reduced toxic side effects