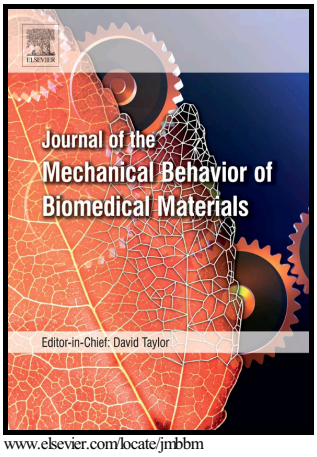
Diopside-Magnetite; A novel nanocomposite for hyperthermia applications

Majid Abdellahi, Ebrahim Karamian, Aliakbar Najafinezhad, Amirsalar Khandan



www.elsevier.com/locate/jmbbm

PII: S1751-6161(17)30441-1
DOI: https://doi.org/10.1016/j.jmbbm.2017.10.015
Reference: JMBBM2535

To appear in: *Journal of the Mechanical Behavior of Biomedical Materials*

Received date: 22 August 2017
Revised date: 5 October 2017
Accepted date: 8 October 2017

Cite this article as: Majid Abdellahi, Ebrahim Karamian, Aliakbar Najafinezhad and Amirsalar Khandan, Diopside-Magnetite; A novel nanocomposite for hyperthermia applications, *Journal of the Mechanical Behavior of Biomedical Materials,* https://doi.org/10.1016/j.jmbbm.2017.10.015

Diopside-Magnetite; A novel nanocomposite for hyperthermia applications

Majid Abdellahi*, Ebrahim Karamian, Aliakbar Najafinezhad, Amirsalar Khandan

Department of Materials engineering, Najafabad University, Isfahan, Iran

**Corresponding Author; Email: Majid_abdellahi@yahoo.com ; Tel: +989132894596*

Abstract

In the present work, the releasing heat, scaffold apatite formation, and magnetic behavior of a novel diopside-magnetite nanocomposite with various contents of magnetite (Fe_3O_4) were evaluated. The N´eel and Brown relaxations did not have a significant effect on the specific absorption rate (SAR) of the composite samples. Indeed, magnetic saturation, M_s, indicated a crucial effect on the heat release of the samples. The sample with 30wt.% magnetite had the highest value of SAR, while the sample with 20wt.% magnetite, in the form of scaffold, allowed the high amount of apatite formation on its surface.

Keywords: Hyperthermia; Bioceramics; Ceramic composite

1- Introduction

When magnetic nanoparticles (MNPs) are placed in an alternating magnetic (AC) field, they release heat. This released heat as a therapeutic tool that is called “hyperthermia”, can destroy the cancer tumor cells by raising temperature within the range of 41–46 °C [1].

Fe_3O_4 (magnetite) nanoparticles, have shown a good potential for using in different biomedical applications including, magnetic resonance imaging, magnetic carriers for drug delivery, and hyperthermia [2]. In recent years, the incorporation of Fe_3O_4 nanoparticles into bio-phosphate materials with a good biocompatibility behavior was reported [3].

Bio-silicate materials, especially those containing Mg have also indicated an improvement of cell adhesion, proliferation, spreading, and differentiation, making them applicable for tissue