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**ABSTRACT:**

# Advanced Induction Post Processing of Additively Manufactured Metallic Biomaterial Lattices

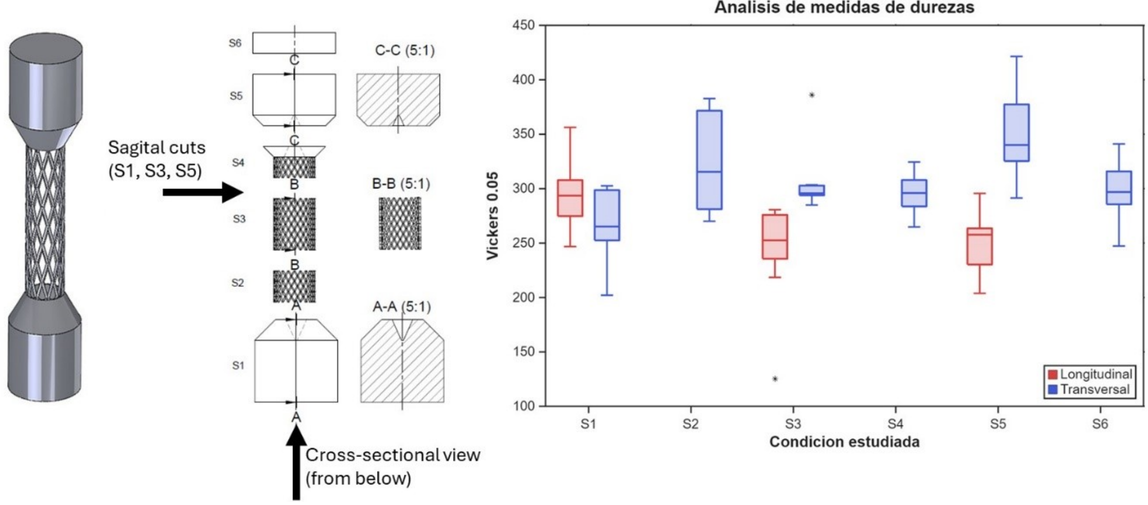
M. Muñoz[1,2], B. Martín[1], Valdés, D.[1,2], J. Rams[1,2], B. Torres[1,2], M. Multigner[1]
[1]Department of Applied Mathematics, Materials Science and Engineering and Electronic Technology, Escuela Superior de Ciencias Experimentales y Tecnología (ESCET), Universidad Rey Juan Carlos, C/Tulipán s/n, 28933 Móstoles, Spain
[2]Institute of Research on Technologies for Sustainability (ITPS), Universidad Rey Juan Carlos, C/Tulipán s/n, 28933 Móstoles, Spain

Metallic lattice structures manufactured through additive techniques are increasingly employed in a wide range of applications such as chemical engineering [1] or biomedical field, through the fabrication of medical implants [2]. However, the layer-by-layer melting and solidification inherent to additive manufacturing processes generate significant residual stresses, which can compromise mechanical performance, dimensional accuracy, and long term structural reliability. In this work, an advanced inductive post processing approach is investigated as a fast, contact free, and energy efficient strategy for relieving residual stress in metallic lattices intended for biomedical applications on two metallic alloys FeMnC and 316L Austenitic steel.

The proposed method relies on the use of high frequency alternating electromagnetic fields to induce localized Joule heating in the structural elements of the lattice. Due to their high surface to volume ratio and geometrical complexity, these architectures respond particularly well to controlled inductive heating, enabling targeted thermal exposure without compromising the overall integrity of the part.

To validate the effectiveness of this approach, a systematic experimental study is conducted on additively manufactured metallic lattices subjected to inductive heating under different magnetic field intensity and registering the temperature with an infrared camera.

Microstructural, mechanical and electrical properties are evaluated through optical and scanning electron microscopy, Vickers hardness (fig. 1) and electrical conductivity measurements performed before and after the inductive treatment. Preliminary results show reduction in hardness gradients, consistent with partial relaxation of residual stresses.




(a) (b) (c)

Figure 1: (a) Diamond stent designed for mesh geometries hardness test. (b) Sagital and transversal sections of the stent. (c) Vickers hardness across the six sections of the stent.

This study demonstrates the potential of high frequency electromagnetic induction as a versatile post processing technique for metallic lattices. Its speed, adaptability to complex geometries, and non invasive nature offer clear advantages over conventional heat treatments, highlighting its feasibility for future integration into industrial additive manufacturing workflows.

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References.

[1] Sistema reactor y método para la valorización de residuos plásticos, patente N.º: ES 2 994 409 B2

[2] M. Peto, J. García-Ávila, C.A. Rodriguez, H.R. Siller, J.V.L. da Silva, and E. Ramírez-Cedillo, Front. Mech. Eng., 10, 1353108 (2024).