INTERNATIONAL WORKSHOP ADITIVE MANUFACTURING

2ND INTERNATIONAL WORKSHOP

ADDITIVE MANUFACTURING AND SUSTAINABILITY

BOOK OF ABSTRACTS

IWAM 24

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WELCOME

We are pleased to present the International Workshop on Additive Manufacturing and Sustainability Book of Abstracts. This compilation brings together researchers, professors, and innovators from around the world who are advancing additive manufacturing (AM) and sustainable practices.

As the global community prioritizes environmental responsibility, additive manufacturing has emerged as a transformative technology capable of revolutionizing industries while reducing ecological footprints. This workshop unites advanced research, innovative applications, and progressive strategies to examine how additive manufacturing can enhance sustainability.

Within these pages, you will find a diverse array of abstracts showcasing ground-breaking work in areas such as:

Sustainable materials and processes in AM,

Energy efficiency and waste reduction,

Circular economy and lifecycle analysis,

Each contribution reflects a commitment to addressing the challenges and opportunities at the intersection of technology and sustainability. We hope this collection not only informs but also inspires collaboration and innovation among participants.

We are profoundly grateful to the authors, reviewers, and organizers whose unwavering commitment has enabled the publication of this book. A special thank you to our sponsors and partners for their unwavering support in bringing this workshop to life.

We appreciate your participation in this wonderful adventure. Let's work together to advance sustainability and innovation!

Warm regards,

The IWAM 2024 Organizing Committee,

João Rocha

João E. Ribeiro

Jorge Santos

Rui Lima

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Extraction of natural fibers for the manufacture of 3D filaments by FDM material extrusion

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The study aimed to extract hemp fibers for the NaturFab project, in order to mechanically strengthen PLA in filaments for 3D printing. In order to find the best extraction method, several chemical treatments were carried out to separate the fibers from the plant, using solutions of 2 g/l of sodium hydroxide (NaOH) + 2 g/l of sodium carbonate ($NaCO_3$) and another solution of 6% NaOH, both at 80 ºC. After obtaining the first fiber sample, tensile tests were carried out to compare the strength of the hemp fibers with those of commercial flax. Hemp showed inferior performance compared to flax fibers, with a more fragile behavior after treatment with 6% NaOH. However, a solution of NaOH and $NaCO_3$ with polyglycolic detergent facilitated extraction and improved fiber strength, but further tests should be carried out to verify its effectiveness.

Keywords: Hemp Fiber Extraction; Chemical Treatments; PLA Reinforcement; Tensile Strength.