AGRI-FOOD WASTE VALORIZATION FOR DLP 3D PRINTABLE ADVANCED MATERIALS

Annalisa Chiappone[1*], Maria Vittoria Piras[1], Maria Chiara Cabua[1], Michel Zanon[2], Francesco Secci[1], Ignazio Roppolo[2]

[1] Dipartimento di Scienze Chimiche e Geologiche, Università degli Studi di Cagliari, S.S. 554 bivio per Sestu 09042, Monserrato (Ca) ITALY [2] Dipartimento di Scienza Applicata e Tecnologia, Politecnico di Torino, Corso Duca degli Abruzzi 29, 10141 Torino (To) ITALY

Every year, enormous amounts of agri-food waste are produced, which presents a significant issue from an environmental and financial standpoint. According to the circular economy's tenets, these wastes can be repurposed as secondary starting materials to create objects with added value.[1]

The present work is based on the extraction and functionalization of organic molecules, ranging from cellulosic components to anthraquinones, from Aloe Vera and aloe Arborescence Sardinian cultivation wastes. The extracted fractions are used as materials for the development of photocurable polymers suitable for light induced 3D printing (3DP).

Work done so far has focused on the extraction of micro cellulose semicrystalline particles (MC). On one side, MC has been functionalized to obtain acrylate microparticles that can act as fillers or crosslinkers in a photocurable formulation. Beside the simple use as natural filler, the choice of the correct copolymers enables the formation of covalent adaptable networks[2] (CANs) able to be reprocessed under external stimuli (e.g. temperature). The best printing conditions have been optimized for the production of samples and the ongoing study of the thermomechanical properties of the developed materials will disclose the CAN behavior of the developed materials.

On the other side, MC has been solubilized and functionalized using eutectic solvents[3] enabling the 3D printing of flexible polymers in which the cellulose chains act as crosslinker.

References

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