From dairy product waste to plastic: preparation and characterization of new fully biobased composite materials

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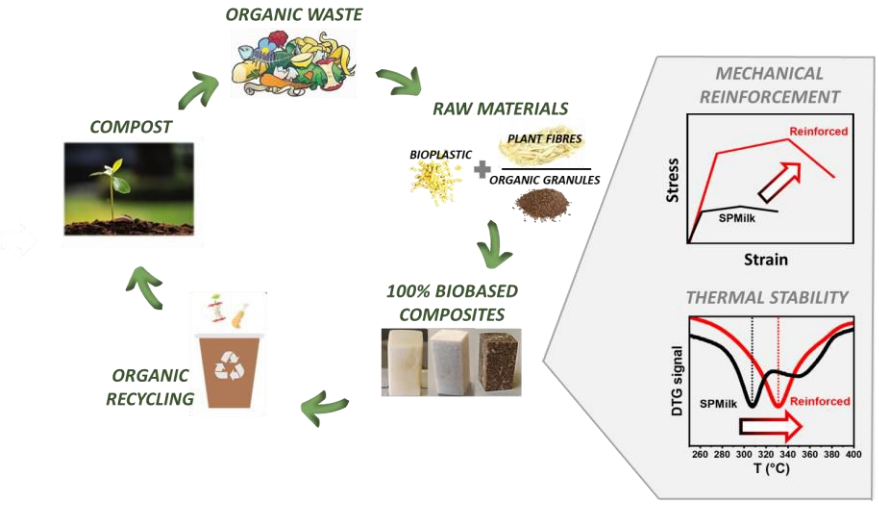

Organic waste is a virtually unlimited and inexpensive source of raw materials and represents a powerful matrix for the development of biobased materials due to the abundance of important biomolecules. This study investigates the influence of the addition of different organic-based additives on the physical-mechanical properties of a new biomass-derived material. The investigated samples are made of a bulk innovative biomaterial named SP-milk® that is a 100% biobased, biodegradable and compostable material produced from dairy waste by Splastica®srl through a sustainable process. Plant fibres and inert organic particulate were used to improve the material characteristics. Compression and flexural tests were performed to study the mechanical characteristics. The addition of short randomly orientated fibres increases flexibility with a slight improvement in hardening resistance obtained with the higher percentage tested (1 wt%). Longer fibres led to a more effective reinforcement as a result of the effect of residual resistances. The addition of 20 wt% inert granules gave a harder and more resistant material, although with concomitant loss of ductility. The combination of fibres and granules resulted in the preservation of the positive effects of both components. The surface morphology was examined by scanning electron microscopy, focusing on the failure zones after flexural tests. Thermal analysis demonstrated the improved thermal stability of the composites with respect to the parent matrix. The results obtained here demonstrate that the use of suitable natural reinforcement agents is effective in improving a biobased and biodegradable material while preserving its sustainability.