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When Food Becomes Heritage Matter: Microbe Ecologies, Circular Materials and Sustainable Conservation

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Abstract

Food and agricultural waste materials have long occupied an unstable position between matter, culture, memory, decay and transformation. In contemporary artistic and heritage contexts, they are increasingly mobilized not only as symbolic or sensory materials, but also as active biological, ecological and social agents. This communication presents recent work from the Heritage, Conservation and Restoration and New Media Art research groups at CITAR/UCP, exploring how circular bioeconomy, microbial ecology, green conservation and inclusive education can reframe food, food residues and bio-based materials as part of a broader material ecology of cultural heritage and artistic practices. Our research investigates the valorisation of agro-industrial, marine-derived and food-chain residues for conservation and artistic applications, including chitosan-based antimicrobial coatings derived from seafood industry by-products, cellulose fibers obtained from Portuguese vine pruning residues as well as microorganisms themselves, such as fungi and mushrooms. Rather than treating these residues as waste or food, we approach them as culturally and materially meaningful resources capable of generating new conservation materials, tactile educational replicas, coatings, gels and experimental heritage interfaces. In this sense, food-related residues become part of an expanded field of artistic and conservation materials, connecting circular economy with material experimentation, ecological responsibility and cultural transmission. This communication also invites a reflection on the biological instability of food-based matter. Organic materials are rarely inert: they ferment, oxidize, attract microbial colonization, release volatile compounds and change in response to environmental conditions. Recent developments in our work also integrate environmental sensors, data analytics and machine-learning approaches to support evidence-based conservation decision-making as well as artistic production. Projects such as GraspingHERITAGE extend this reflection beyond preservation and into education, accessibility and community engagement. By developing tactile and multisensory replicas for safer museum learning experiences, the project explores how material surrogates can expand access to heritage while reducing risks to original objects. In this framework, circular bio-based materials are not only technical substitutes, they become pedagogical tools that enable sensory participation and inclusive forms of cultural experience. This communication argues that food as art material should be understood within a wider ecology of transformation, involving residues, microorganisms, sensory experience, environmental change, circular material flows and social participation. By bringing together conservation science, biotechnology, microbial monitoring, machine-learning sensors and community-oriented heritage education, our work proposes a sustainable and interdisciplinary framework for engaging with food-derived materials in artistic and heritage contexts.

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Keywords: circular bioeconomy, cultural heritage, green conservation, biodeterioration, food residues, bio-based materials, inclusive heritage

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