Nanomaterials from agro- mining, and fishery waste for advanced agriculture applications

Simone QUARANTA - Institute of nanostructured materials (CNR-ISMN) – Roma Sapienza

The present investigation proposes the synthesis, characterization, and application of a whole “hodgepodge” of “low-cost/low-end” nanostructure materials in order to improve agriculture’s sustainability according to circular economy principles. In particular, this research targets the conversion of mining (i.e. tailings), agricultural (rice husk) and fishery (bones and scales) residues into nanostructured materials amenable to modern agriculture. Specifically, the present work explores: Manganese (a micronutrient) recovery from Amazon rainforest mining tailings to produce nanostructured manganese oxides (e.g. potassium birnessite) to be used as nanofertilizers in seed priming applications. Direct use of manganese mining waste or its derivatives (nanostructured manganese oxides and barium manganate) to reinforce starch membranes for shopping bags and mulching applications. Amazon fishery waste as source of hydroxyapatite to remove pesticides from fresh water and to release micro- (e.g. cobalt) and macro- (phosphorous) nutrients. Rice husk-derived zeolite/copper ferrite magnetic composite to adsorb water pollutants stemming from coffee bean refining. The research dovetails with ISMN’s “Economia Circolare and Industria 5.0” strategic research line.