

## **| CIRCULAR ECONOMY: OPPORTUNITIES AND CHALLENGES BY THE VALORIZATION OF AGRO-FOOD WASTES**

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Every year, large amounts of agricultural waste and by-products are generated globally, which have great potential if treated properly. In this context, the concept of circular economy appears, defined as the management procedures to achieve a sustainable socio-economic development, through an efficient use of natural resources. This concept arises as a response to the set of environmental challenges, opening a scenario where the agro-food sector, complemented other industrial sectors, are called upon to play a strategic role. One of the fundamental pillars of the circular economy is constituted by the waste generated within the agro-food sector through its reuse as high added value products. This lecture will bring upon the table the main concepts and priorities of the circular economy approach as well as the opportunities offered by the European Commission and the BBI JU to join this approach.

## **| NATURAL DYES AND ANTIMICROBIALS EXTRACTED AND FUNCTIONALIZED FROM AGRO-FOOD WASTE FOR ADVANCED APPLICATIONS**

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Biomass waste is currently generated in significant quantities worldwide being considered an unavoidable source of potential resources. Advanced valorization alternatives should be developed to maximize the added value derived from such an important waste source. Agrowastes contain biomolecules with interesting functional properties such as antimicrobials, colourants, and fragrances that can be extracted by using green techniques such as microwave-assisted extraction (MAE). These compounds could be functionalized into nanoclays to increase their thermal stability and combined with the use of biopolymers to be potentially applied for the development of innovative functional materials in advanced applications such as automotive and building, among others. This circular economy approach presents environmental and economic opportunities as well as challenges. The aim of this conference is to highlight the results obtained in the BARBARA project as a successful example of agro-food waste valorization and industrial application by the extraction and functionalization of high-added value compounds.

## **| MICROWAVE-ASSISTED EXTRACTION AS A POTENTIAL GREEN TECHNIQUE FOR OBTAINING VALUABLE COMPOUNDS**

Prof. Diego Carnaroglio,  
Business Development & Application Manager at Milestone

The traditional way of isolating bioactive compounds such as essential oils and antioxidants from plant raw materials are conventional steam/hydro distillation, mechanical treatments (cold pressing, sonification) and solvent extraction (ethanol, hydrocarbon, supercritical solvents).

These traditional extraction techniques are affected by several limitations: long extraction times, large amount of environmental unfriendly solvents, critical purification steps and partial chemical degradation. Microwave is capable to overcome these limitations providing a green energy source to a rapid, solvent-free extraction of natural products. Two innovative and patented microwave extraction techniques are applied for obtaining valuable compounds from different sources posing an effective alternative for extract producers to enhance product quality and better establishment on the market.

## **| BIOCOMPOSITES WITH ENHANCED PROPERTIES BY USING NATURAL BIOADDITIVES: A SUCCESSFUL APPLICATION OF VALORIZATION**

Prof. Debora Puglia, University of Perugia

Ecological concerns related to the use of synthetic dyes have motivated industries to consider the replacement of these compounds by eco-friendly non-toxic natural dyes to minimize the negative environmental impact and health hazardous problems of synthetic dyes. Natural dyes and pigments, extracted from natural sources, such as food waste (lemon, pomegranate, broccoli), can be used as polymer additives for their antimicrobial, antioxidant or deodorant properties. We demonstrated that several typical drawbacks of these natural dyes, such as poor color fastness to the light, difficult color reproduction, limited color range, reduced chemical and thermal stability, can be surpassed by using nanoclays as hosts for the dyes. We also proved that controlled release of antioxidant and antimicrobial extracts, such as essential oils, is another opportunity given by the inclusion of these hybrid nanofillers in biopolymeric formulations.

## **| RAPID TOOLS FOR ANTIMICROBIAL ANALYSIS**

Dr. Manfred Schinking, Vice President Microbiology, SY-LAB Geraete GmbH.,  
Neupurkersdorf Austria

Impedance technology is an online microbial growth detection technology that is used to detect and/ or enumerate various microbes in standard food or cosmetic microbiology. Compared to traditional microbiological methods it is advantageous in terms of speed and simplicity.

Using reference or indicator strains it could also effectively be applied for antimicrobial screening as well as for the evaluation of inhibitory activity of biocides or compounds showing antimicrobial activity.

The technology has already been used to study the antimicrobial effects of various plant extracts and for preservative efficacy studies.

The method principle as well as examples of possible applications will be presented.