Valorization of crude glycerol via yeast fermentation processes for the synthesis of Carbon Dots

Mirko Frigerio[1], Benedetta Squeo[2], Maria Cecilia pasini[2], Valeria Mapelli[1]
E-mail: valeria.mapelli@unimib.it
[1] Dept. of Biotechnology and Biosciences, University of Milan-Bicocca, Italy
[2] Institute of Chemical Sciences and Technologies “G. Natta”-SCITEC, National Research Council, CNR-SCITEC, Italy

Keywords: *Yarrowia lipolytica*, Carbon Dots, citric acid, crude glycerol

Abstract: Industrial waste streams can be of diverse nature and many industrial waste streams have a biodegradable fraction that can be considered a sustainable source of biomass. Waste valorization via production of energy or commodity chemicals would result in decreasing the volume of waste that needs to be managed, in minimizing the environmental impact and in generating added value through the synthesis of a wide range of products. In this work we present one example of industrial waste valorization showing the conversion of glycerol-rich waste streams deriving from biodiesel production into citric acid via a *Yarrowia lipolytica* cell factory. Wild-type and engineered *Y. lipolytica* strains have been used (1), leading to 120 g/l citric acid as maximum titer achieved. The produced citric acid has been used for the synthesis of Carbon Dots (CDs), that is a new type of carbon-based nanomaterials that have attracted broad research interest due to their excellent and tunable photoluminescence, high quantum yield, low toxicity, small size, appreciable biocompatibility (2). We demonstrated that CDs produced with glycerol from biodiesel waste have physicochemical properties equal to the ones of CDs produced with pure citric acid; thus, proving that glycerol-reach waste streams can be valorised via microbial cell factories for production of materials that find their application in diverse fields, such as biomedical and optoelectronics.

References

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