Development, chemical and physical characterization of multifunctional materials for biomedical, cosmetic, and environmental applications

Jennifer Gubitosa[1,*], Vito Rizzi[1], Angela Agostiano[1,2], Paola Fini[2], Pinalysa Cosma[1,2]

[1]Università degli Studi "Aldo Moro" di Bari, Dipartimento di Chimica, Via Orabona, 4- 70126 Bari, Italy
[2]Consiglio Nazionale delle Ricerche CNR-IPCF, UOS Bari, Via Orabona, 4- 70126 Bari, Italy

*e-mail: jennifer.gubitosa@uniba.it

The aim of this work involves the synthesis and characterization of innovative multifunctional materials for applications in biomedical, cosmetic and environmental fields. In particular, food/agricultural wastes derived from grape, kiwi fruit, *Punica Granatum*, etc. are proposed as raw materials from which extracts can be obtained and used for synthetizing nanomaterials (i.e. gold nanoparticles AuNPs) [1] by adopting approaches in accordance with the principles of Green Chemistry. These extracts act as reducing agents towards an aqueous solution of metal salt such as gold, thanks to the content of high added-value molecules (i.e., polyphenols), allowing the formation of nanoparticles. [1] These hybrid nanosystems, if coated with biocompatible and biodegradable polymers such as chitosan, and further functionalized with other molecules derived from the same natural extracts, can find application as nano-multifunctional supramolecular platforms in the biomedical fields: for photodynamic therapy (PDT), including antibacterial (aPDT), photothermal therapy (PTT), and for accelerating wound healing process, as well as for cosmetic formulations having antioxidant, skin-lightening and sunscreen properties [2]. The obtained AuNPs are characterized through several complementary techniques, namely UV-Visible, ATR-FTIR and XPS spectroscopies, XRD, TEM, DLS and Zeta Potential analyses. [1, 2] An alternative use of the mentioned wastes is proposed as adsorbent materials for the removal of emerging contaminants from water, considering them as resources, in order to create a virtuous eco-sustainable cycle, according to the Green Economy principles. The adsorption process is studied by evaluating the effect of several physico-chemical parameters on the pollutants removal.

References

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