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Synthesis, characterization and antimicrobial activity of polyaminocyclodextrin-capped Ag Nanoparticles

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Biocompatible Ag nanocomposites were prepared by photoreduction of ammoniacal silver acetate in the presence of a polyaminocyclodextrin, namely the poly-{6-[3-(2-(3-aminopropylamino)-ethylamino)-propylamino]}-(6-deoxy)-b-CD (**amCD**, figure 1). The obtained Ag-amCD systems, which possess an oniontype structure [1] with a metal core surrounded by several layers of the capping agent, were characterized by means of various complementary techniques. In particular, FT-IR spectroscopy confirmed the presence of the amCD scaffold in the composite, and evidenced a partial oxidative degradation of the polyamine branches,due to the fact that these groups function as sacrificial reducing agents in the photoinduced process of formation of the Ag metal core. TEM and SAED micrographs evidenced that the Ag cores possess a relatively low polydispersity and a significantly crystalline character.Then, in consideration of the well-known antimicrobial activity of nanosized silver, our **Ag-amCD** systems were assayed for antibacterial activity, quantified as the minimal concentration inhibiting at least the 90% of bacterial growth (MIC90), using Escherichia coli and Kocuria rhizophila as Gram-negative and Gram-positive tester strains. This analysis revealed 5 and 1 μg/ml as MIC90 values against E. coli and K. rhizophila; respectively. In addition, thanks to their peculiar features, the systems function as potential supramolecular drug carriers, effectively able to bind the b-lactam antibiotic Ampicillin (amp, figure 2) as demonstrated by polarimetric measurements. Antimicrobial assays reveals a five-fold improved activity of

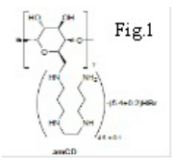
Fig.1

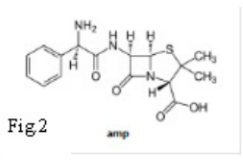
Fig.2

Ag-amCD-amp probably due to synergistic action of Ag nanoparticles and amp. This study provides insights on the attractive possibility to use an environmentally-friendly methodology to produce bioactive supramolecular systems to be employed as powerful and tunable antimicrobial agents.

[1] M. Russo, F. Armetta, S. Riela, D. Chillura Martino, P. Lo Meo, R. Noto J. Mol. Cat. A 408 (2015) 250-261.