

**GOLD NANOPARTICLES/EXFOLIATED GRAPHENE HYBRID OBTAINED BY
GAMMA IRRADIATION**

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Abstract

Gold nanoparticles decorated graphene sheets present a good surface-enhanced Raman spectroscopy (SERS) platform for the development of ultrasensitive analytical applications. Here, we prepared gold nanoparticles/exfoliated graphene hybrid by gamma irradiation of chloroauric acid as a precursor in the presence of electrochemically exfoliated highly oriented pyrolytic graphite (HOPG). The effects of various irradiation doses (1, 5, 10 and 20 kGy) on the size and shape of synthesized nanoparticles were studied. It was found that the presence of HOPG leads to the formation of gold nanoparticles of triangular, spherical, hexagonal, trapezoidal and rod-shape morphology. On the other hand, irradiation of chloroauric acid solution without HOPG results mainly in irregular shaped nanoparticles, however, certain amount of square shaped nanoparticles is observed. According to statistical analysis of gold nanoparticles/graphene hybrid, nearly half of the nanoparticles have sizes in the 11-20 nm range for all of the applied doses. The increase of irradiation dose results in the increase of the amount of smaller nanoparticles (up to 10 nm in size). Nevertheless, for the highest applied dose agglomeration of nanoparticles takes place leading to the formation of particles that exceed 100 nm in size. Presented synthetic route is fast, simple and low-cost since it does not require the use of a gold nanoparticle stabilizer.