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Published in:
Proceedings of the 24th International Conference on Raman Spectroscopy

Publication date:
2014

Chemical preparation and spectroscopic characterization of plasmonic silver nanoparticles using fruits as reducing agent.

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Silver and gold nanoparticles (NPs) have gained a lot of interest in recent years due to a wide range of applications. As a very important property, these metal NPs exhibit strong surface plasmon resonances in the optical range. Coupling between surface plasmons and light results in high local fields in the vicinity of the NPs. These enhanced local fields open up exciting capabilities for probing and sensing, in particular also in fields such as medicine and biology. Therefore, NPs should be free of toxic chemicals, which are often used in conventional chemical preparation methods [1]. There are several approaches during the recent years which have show that plant extracts can act as reducing and capping agents for the synthesis of metal NPs. Green synthesis does not require any toxic chemicals in the synthesis of the NPs, which makes it eco-friendly and very attractive [2, 3]. The use of biological entities for generation of NPs can be a rapid, sensitive and selective method [4].

Here we report the synthesis silver NPs from silver nitrate. Pineapples and oranges deliver the reducing agents (figure 1).

Figure 1 Silver nanoparticles made from orange and pineapple extracts.

Fruit extracts were collected directly from the pineapple or had been extracted from orange peels in a boiling process [5].
The formation of silver nanoparticles starts after 1mM $AgNO_3$ was added to the fruit extract in volume rations of approximately 10:1.

Size and shape of the particles are characterized by electron microscopy. The reduction process and the formation of nanoparticles can be monitored by UV–visible spectroscopy using the increase of the surface plasmon absorption band.

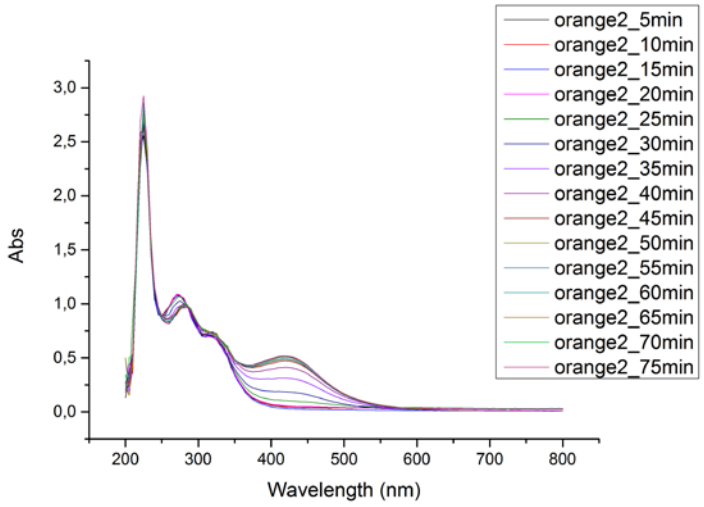

Figure 2 Time development of the surface plasmon band around 420 nm during the reduction process.

Figure 2 shows the characteristic band growing over 75 minutes. In addition, over time, we observed a small red shift of the surface plasmon resonance which indicates the formation of slightly bigger NPs.

In our experiments, pineapples and oranges result in differently shaped silver NPs. By changing the concentration of the extracts, the reduction time, size and morphology of the NPs can be altered.

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