

# Mass spectrometric study of magnetic gold-cobalt nanocomposite and applications for detection of biomolecules

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Gold nanoparticles are used in biomedicine since many years due to their unique properties and applications [1]. Recently, magnetic bimetallic Au nanoparticles/nanocomposites with the combination of magnetic Fe (or iron oxide) and Co nanomaterials were prepared. These materials are mostly studied because, Au confers biocompatibility, optical properties and benefits of easy functionalization, while Fe or Co gives easy magnetic control due to their magnetic properties [2]. The use of bimetallic nanoparticles/nanocomposites Au-Fe in detection of small biomolecules via MALDI has also been reported [3].

Laser Desorption Ionization (LDI) Time-of-Flight Mass Spectrometry (TOFMS) has proven a potential analytical technique to characterize nanoparticles and their utilization for biomolecule detection [4]. Consequently, we have used this method to generate and study the clusters formed via interaction of laser pulses with different Au-Co nanomaterials as a precursor.

The Au-Co nanocomposites were prepared by different methods. The products were examined via LDI TOF MS in positive ion mode. In case of the mixture of  $\text{CoSO}_4$  and gold nanoparticles, the laser ablation produces several positively charged clusters ( $\text{Au}_m^+$ ,  $\text{Co}_n^+$ , and  $\text{Au}_m\text{Co}_n^+$ ). A series of gold clusters  $\text{Au}_m^+$  ( $m=1-11$ ) was also detected. The nanocomposites prepared in two different methods were used for the detection of standard peptide mixtures. The results obtained using Au-Co enriched  $\alpha$ -cyno-4-hydroxy cinnamic acid (CHCA) as a matrix show increased peak intensity for most of the peptides as compared to only use of CHCA as a matrix.

Concluding, LDI TOF MS can be used with advantage to examine various inorganic nanomaterials, clusters, and/or nanocomposites. The results obtained are helpful for understanding the processes proceeding in plasma plume due to interaction of laser pulses with solid-state materials. The produced Au-Co nanocomposites can be used to improve ionization of many other biomolecules via nanoparticles assisted LDI/surface assisted LDI (NALDI, SALDI) methods.

## References

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