Mass spectrometry of nano materials

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Presentation deals with selected nano-materials and clusters, theirs characterization, toxicological aspects of some nano-particles and applications of mass spectrometry with time-of- flight analyzer (TOF MS) for mass-spectrometric analysis of these materials and also for laser ablation synthesis.

Three extensive reviews dealing with nano-silver, nano-gold and carbon nano-tubes were worked out and published. Applications in nano-technology, bio-analytics and in medicine were described and toxicological properties evaluated. Health risks of not well considered applications of anti-microbial nano-silver for human health and environmental contamination are worrying. On the other hand, it seems that no toxicological or health risks concerning nano-gold are described up to now. Extensive applications of nano-gold in medicine are summarized and reviewed in details.

Experimentally, using LDI (or MALDI) TOF MS methodology, the laser ablation, desorption and ionisation of several compounds, first of all nano-gold, nano aluminium nitride and of some precursors for laser ablation synthesis, was studied. Modified method for synthesis of nano-gold in aqueous solution was worked out and formation of Au_m (m = 1-55) gold clusters during laser desorption ionisation was described. It was shown that nano-gold is possible to use as a matrix in MALDI and also that can be applied as suitable standard for mass spectra calibration. The results of detailed LDI study of nano-AlN and determination of composition of ten's Al_mN_n, clusters is significant for pulsed laser deposition of nano-AlN. Study of mass spectra during laser ablation of (nano-gold + nano-diamond) or (nano-gold + red phosphorus) mixtures a series of up to now not $Au_mC_n^{\pm}$ carbides or $Au_mP_n^{\pm}$ phosphides of gold were described. They might have significance for nano-technology and synthesis of new materials.