Sveučilište u Zagrebu

P R E D A V A NJ E

Aula Rektorata Sveučilišta u Zagrebu
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Professor Günter Allmaier, Ph.D.

Institute of Chemical Technologies and Analytics,
Vienna University of Technology,
Getreidemarkt 9/164, A-1060 Vienna, Austria

New strategies of characterization of vaccines and viruses beyond biological testing: from nano ES GEMMA to ESI QRTOF MS

For characterization of virus-like-particles (VLPs), intact viruses, vaccine particles and virus/VLP-antibody complexes besides immunological and functional parameters usually methods as transmission electron microscopy (TEM), scanning electron microscopy (SEM) as well as atomic force microscopy (AFM), analytical ultracentrifugation, size exclusion chromatography (SEC), asymmetric flow field-flow fractionation (AF4), multiangle light scattering (MALS) or dynamic light scattering (DLS) are used. The use of nano electrospray (nano ES) or nano ES ionization (nano ESI) for such kind of nano-objects is a relative new development, i.e. to bring such kind of nano-bioobjects as intact species into the gas-phase at atmospheric pressure. Now it is possible to generate ions with multiple charges as well as a single charge fixed on such nanobioparticles. How this is done in different ways will be discussed in detail.

Here, we want to present two techniques which open up new avenues of analysis of whole viruses, VLPs, vaccine particles and virus/VLP-antibody complexes. First the nano ESI ion source with the charge manipulation (reduction) device for the differential mobility analyzer (DMA) and then for the mass spectrometric analyzer (QRTOF) will be described and discussed. Also the requirements of the quality of the samples will be discussed and examples will be given. Afterwards the separation principle of the nano DMA and its design will be presented. The whole system is also called gas-phase electrophoretic mobility macromolecular analyzer (GEMMA), macroIMS (ion mobility spectrometry), nES-DMA or Liqui-Scan.

The characterization by means of nano ES GEMMA (DMA and PDMA) and nano ESI QRTOF MS of intact viruses – human rhinovirus (so-called “common cold” virus), of virus/VLP-antibody complexes, of inactivated viruses – encephalitis vaccines and of different VLPs – human papilloma and hepatitis virus – will be shown.