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Chip Electrophoresis of Fluorescently Labelled Virus Particles

Victor U. Weiss
TU Wien, Institute of Chemical Technologies and Analytics, Vienna, Austria, victor.weiss@tuwien.ac.at

Summary

Capillary zone electrophoresis (CZE) on a commercially available chip electrophoretic platform has already been demonstrated in a series of papers (e.g. [1, 2]). Focusing on fluorescently labelled particles of a human rhinovirus (common cold virus), it was possible to detect native, infectious virus particles and to separate virions from a co-purified contaminant, which was likewise modified via the applied fluorophore. Subsequent measurements followed the binding of virus particles to recombinant receptor molecules and receptor-decorated liposomes [3, 4]. Furthermore, the application of molecular beacons - small oligonucleotide probes showing a closed hairpin conformation in the absence of a complementary sequence and hence spatial proximity of a fluorophore and quencher - was possible, to target the release of the viral RNA genome via an increase in fluorescence [5].

On the basis of these experiments, we turned to the analysis of virus-like particles (VLPS) based on SARS-CoV2, the source of the recent COVID-19 pandemic. VLPs resemble native virions but no longer include the genomic material of the parent virus inside their core, hence, they are no longer infectious. We were able to demonstrate that also for this bionanoparticle analyte labelling via a fluorophore was possible. Resulting particles were still recognized by antibodies binding the VLP surface despite capsid modification via the applied dye. Nanoparticle tracking analysis enabled us to assess particle loss during the labelling process and subsequent removal steps of excess dye prior to CZE analysis. In overall, we found also CZE analysis of fluorescently labeled SARS-CoV2 VLPs possible via the chosen commercially available chip electrophoretic setup. Furthermore, we believe that CZE enables to target the question of VLP stability upon storage – an important parameter e.g. for VLP based vaccine development.

References

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