OPEN ACCESS Freely available online

ISSN: 2161-1009
Biochemistry & Analytical Biochemistry

Perspective

An Overview on Enhanced Electrostatic Biomolecule Detection

Jain Martis*

Department of Pharmacy, University of Valencia, Valencia, Spain

DESCRIPTION

Detecting biomolecules, such as proteins and nucleic acids, is vital in many industries, such as biotechnology, drug discovery, and medical diagnostics. Due to their sensitivity and label-free nature, electrostatic detection approaches have showed potentiality in the detection of biomolecules. Electrostatic detection, however, has a restricted range of applications because to its inherent difficulties, including low signal-to-noise ratio and nonspecific binding. In order to overcome these difficulties and improve the sensitivity and specificity of the detection process, they will examine a hybrid method that combines electrostatic detection with other techniques in this essay.

Over the past few decades, nano carrier-based medication delivery has made enormous strides. Because of its numerous programmes, such as excessive entrapment efficiency, the ability to carry out twin drug transport, and being susceptible to numerous drug administration routes, noisy research has recently gained substantial interest. While biomolecules have similar properties along with their more advantageous lipophilic nature, low permeability, and high solubility, which permits them to be used for the prevention and treatment of a variety of diseases, essential oils have historically been known to have antioxidant, antiviral, antibiotic wound restoration, and anti-zits properties. However, because of their high concentrations and low biocompatibility, vital oils and biomolecules cannot be employed for direct topical management. They can also induce localised discomfort.

Charged biomolecules and an electric field combine to produce electrostatic detection. The local electric field changes when a biomolecule connects to a charged surface or electrode, and this change can be detected as a signal. This idea has been used in a number of electrostatic sensing techniques, including as impedance spectroscopy and Field-Effect Transistor (FET)-based biosensors. These methods provide label-free, real-time biomolecule detection without the requirement for time-consuming sample preparation or labelling steps.

Electrostatic detection techniques, however, have a number of drawbacks. Low signal-to-noise ratio, which is caused by background noise, nonspecific molecule binding, and other types of interference, is one of the biggest problems. This can result in false positives or false negatives, lowering the detection process' accuracy and dependability. Additionally, non-specific biomolecule attachment to the detecting surface can impair the assay's specificity by causing cross-reactivity and reduced selectivity.

A hybrid strategy that combines complementing approaches with electrostatic detection can be used to get around these restrictions. The sensitivity and specificity of biomolecule detection can be increased by combining electrostatic detection with other techniques, producing findings that are more dependable and precise. Combining electrostatic detection with Surface Plasmon Resonance (SPR) imaging is one such hybrid technique. SPR is an optical technique that tracks changes in the refractive index caused by biomolecule binding close to a metal surface. The benefits of both techniques can be taken advantage of by combining electrostatic detection with SPR imaging. SPR imaging gives great spatial resolution and real-time monitoring capabilities, while electrostatic detection offers the sensitivity to detect minute changes in the local electric field brought on by biomolecule attachment. This hybrid technique improves the assay's sensitivity and specificity by enabling simultaneous label-free detection and visualization of biomolecular interactions.

Another hybrid approach combines microfluidics with electrostatic detectors. Fluid flow may be precisely controlled using microfluidic devices, which can also be coupled with electrostatic detecting systems. Microfluidics can be used to effectively convey the sample to the detection zone, reducing nonspecific binding and enhancing signal-to-noise ratio. Microfluidic systems can also support multiplexed detection, enabling the evaluation of numerous biomarkers or targets at once. This combination of electrostatic detection and microfluidics improves test performance by reducing sample volume requirements and increasing sensitivity.

Correspondence to: Jain Martis, Department of Pharmacy, University of Valencia, Valencia, Spain, E-mail: jainmartis@dec.es

Received: 02-Jun-2023, Manuscript No. BABCR-23-21969; **Editor assigned:** 06-Jun-2023, Pre QC No. BABCR-23-21969 (PQ); **Reviewed:** 20-Jun-2023, QC No. BABCR-23-21969; **Revised:** 27-Jun-2022, Manuscript No. BABCR-23-21969 (R); **Published:** 05-Jul-2023, DOI: 10.35248/2161-1009.23.12.495

Citation: Martis J (2023) An Overview on Enhanced Electrostatic Biomolecule Detection. Biochem Anal Biochem. 12:495.