

Impedimetric Electrochemical Sensor Based on The Inspiration of Carnation Italian Ringspot Virus Structure to Detect an Attommolar of miR

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Abstract

Electrochemical sensors are the tools to detect the accurate and sensitive miRs. There is the challenge to increase the power and sensitivity of the surface for the electrochemical sensor. We design a virus-like hallow structure of CuCO_2O_4 that it holds the large amounts of p19 protein by mimicking of inherent virus (Carnation italian ringspot virus) to detect 21mir with the limit of detection (LOD = 1aM). The electrochemical measurements are performed between the potentials at -0.3 V and $+0.3\text{ V}$ with $1\text{ mM } [\text{Fe}(\text{CN})_6]^{-3/-4}$. After dropping the CuCO_2O_4 on the SCPE (screen carbon printed electrode), the sensor is turned on due to the high electrochemical properties. Then, p19 proteins move into the hallow structure and inhibit the exchange of electrochemical reactions between the shells and the sensor is turned off. Then, adding the duplexes of RNA/miRs cause to increase the electrochemical property of p19 due to the change of p19 conformation and the system is turned on, again. So, for the first time, a virus-like hallow structure has been used to detect the 21miR in the human serum, MCF-7, Hella cells, with high sensitivity, specificity, and reproducibility in few minutes.