KLVFF functionalized graphene oxide for Aβ$_{42}$ peptide electrical detection: a promising nanomaterial for the development of Alzheimer's disease diagnostic devices

Silvia Scalese[1]
Viviana Scuderi[1], Simona Filice[1], Simona Crispi[1], Rita Turnaturi[2], Giuseppina Sabatino[2], Damiano Ricciarelli[1], Giuseppe Pappalardo[2]
[1]*ConsiglioNazionale delle Ricerche (CNR), Istituto per la Microelettronica e Microsistemi (IMM), Ottava Strada n°5, Catania 95121, Italy.*
[2]*Consiglio Nazionale delle Ricerche (CNR), Istituto di Cristallografia (IC), via Paolo Gaifami n°18, Catania 95126, Italy*
silvia.scalese@imm.cnr.it

Alzheimer's disease (AD) is a neurodegenerative disorder with high negative impact in terms of cost and social issues [1]. In this work, graphene oxide (GO) sheets were functionalized with KLVFF peptide and they were used as a sensing layer for the detection of Aβ$_{42}$, highlighting the potentiality of the system. In fact, GO offers a large surface area and it provides numerous reactive sites useful for peptide immobilization. The KLVFF peptide, instead, selectively interacts with amyloid-β [2]. The ratio, between GO and peg$_4$-KLVFF was optimized and the nature of the bonds involved in the functionalization process was characterized through Fourier Transform Infrared Spectroscopy (FTIR) and X-ray photoelectron spectroscopy (XPS) analysis. The functionalized material (GO@peg$_4$-KLVFF) was deposited by dielectrophoresis (DEP) between two metallic electrodes to develop a resistive sensing device [3]. The device showed a linear response to Aβ$_{42}$ in the investigated range. The selectivity was validated using two scrambled peptides (Aβ$_{42s}$ and Aβ$_{40s}$) that contain the same amino acids but ordered in a different sequence with respect to Aβ$_{42}$. Effect of Aβ$_{42}$ aggregation on the electrical response was also investigated.

References

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Figures

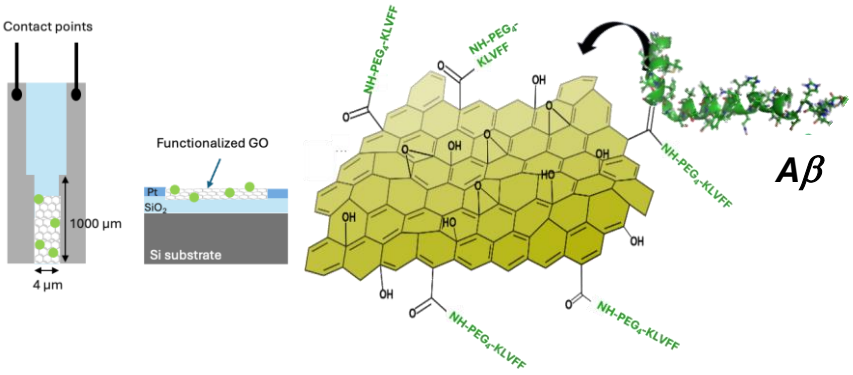

Figure 1: On the left side a schematic of the device and on the right side the functionalized GO layer interacting with Aβ$_{42}$