

APPLICATION OF GOLD NANORODS TOWARDS THE DEVELOPMENT OF ELECTROCHEMICAL BIOSENSORS

Marina Šapauskienė¹, Viktorija Lisytė¹, Almira Ramanavičienė¹, Anton Popov¹

¹Vilnius University
marina.sidorova@chgf.stud.vu.lt

Gold nanoparticles (AuNPs) are attracting great research interest due to their unique physical and chemical properties. This makes them multifunctional materials suitable for applications in various fields such as medicine, environment, and engineering [1].

Among AuNPs, gold nanorods (AuNRs) are in high demand due to the tunability and sensitivity of their longitudinal surface plasmon resonance [2, 3]. The anisotropic structure of AuNRs exhibits two surface plasmon bands corresponding to surface electron oscillation on the transverse and longitudinal sides [4]. The size, shape, and surface functionality of AuNPs are dependent on the synthesis method [5-6].

The main objective of this research was to synthesize AuNRs of different lengths using different synthesis methods and to determine their electrochemical properties. The obtained AuNRs were characterized using SEM and UV-VIS techniques. These techniques allowed a detailed description of the structural and optical properties of the AuNRs and provided valuable insights into the synthesis. The cyclic voltammetry was used to evaluate the electroactive surface area of the electrodes modified with AuNRs. The results of the electrochemical characterization of electrodes were crucial to a more profound understanding of the potential applications of AuNRs.

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- [1] Yao L, et al., Applications and safety of gold nanoparticles as therapeutic devices in clinical trials. *J Pharm Anal.* 2023;13(9):960–7.
[2] Amendola V, et al., Surface plasmon resonance in gold nanoparticles: a review. *J Phys Condens Matter.* 2017, 29(20), 203002.
[3] Cao, J. et al. Gold nanorod-based localized surface plasmon resonance biosensors: A review. *Sens. Actuators B Chem.* 2014, 195: 332-351.
[4] Wu, H.Y. et al. Seed-mediated synthesis of high aspect ratio gold nanorods with nitric acid. *Chem. Mater.* 2005, 17(25), 6447-6451.
[5] Yeh Y-C, et al. Gold nanoparticles: Preparation, properties, and applications in Bionanotechnology. *Nanoscale.* 2012;4(6):1871–80.
[6] Brasiunas B, et al. The effect of gold nanostructure morphology on label-free electrochemical Immunosensor Design. *Bioelectrochemistry.* 2024 Apr;156:108638.