Beyond Obstacles: A Personal Journey into AI-Driven Analysis of Gold Nanoshell Plasmonics

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Gold nanoshells have attracted significant attention for their potential in medical, energy, and catalytic applications. In presenting this work, the speaker also reflects on the challenges of pursuing scientific research as a female scientist from Gaza. Limited access to research infrastructure, restrictions on mobility, and broader socio-political constraints have shaped both the opportunities and the resilience required to contribute to the global scientific community. Despite these barriers, continued engagement in advanced computational research highlights the importance of inclusivity and equitable access in science.

In this study, we investigate the optical extinction properties—specifically scattering and absorption—of solid and core–shell gold nanospheres to inform the design of plasmonic nanostructures. We analyze how particle size, shell thickness, and core refractive index affect plasmonic behavior in gold-shell/air-core (ACNS) and gold-shell/silica-core (SCNS) configurations using COMSOL simulations, with validation against Mie theory. The results show clear links between nanoshell geometry, dielectric value, and localized surface plasmon resonance (LSPR), including resonance shifts and absorption–scattering trade-offs. AI-assisted modelling further identifies outer diameter as the primary factor influencing optical response, enabling targeted optimization for specific applications.