

Appunti di Fisica '26

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Microsoft Teams "Appunti di Fisica"

Multifunctional Plasmonic Alloy Nanoparticles: An eye on their Synthesis, Modelling, and Properties

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Alloying represents a key strategy for developing novel multifunctional plasmonic nanomaterials. Combining multiple properties within a single material, alongside the unique features inherent to nanoparticles, makes this approach highly promising for a wide range of applications, such as photocatalysis, biosensing, and nanomedicine. To address emerging scientific challenges, however, it is necessary to explore the entire periodic table to identify the optimal combination of elements and properties tailored to specific uses, including the exploitation of non-equilibrium alloy nanoparticles. While appealing, this scenario poses several challenges. To successfully develop high-quality multifunctional plasmonic nanoalloys, three fundamental aspects require deeper understanding and advancement: their synthesis, the fundamental understanding of the alloying process, and the modeling of their optical properties. Here, an overview of recent results obtained in these contexts will be presented, showcasing various examples that highlight the critical importance of combined experimental, theoretical, and computational approaches.

