Metal nanoparticles exhibit a rich optical phenomenology due to the excitation of localized surface plasmons (LSPs). A special type of LSP resonances are highly promising for potential applications due to the extremely narrow (asymmetric) line shapes and fine sensitivity to environment changes: Fano LSP resonances [1]. Fano LSP resonances require typically complex multi-particle configurations involving wide, dipolar modes with narrow, dark modes.

Contrary to such common assumption that coupling between nanoparticles is required to excite Fano LSP resonances, we show analytically and numerically in this work [2] that (single) elongated Ag nanoparticles such as nanospheroids, nanorods, and rectangular nanowires, suffice to exhibit asymmetric (Fano) resonances as a consequence of the interference between the broad, (dipole-like) half-wavelength mode, with dark, higher-order modes (see Fig. 1). We make use of explicit analytical expressions for light scattering by spheroids to conclude that not only spectral but also spatial overlap (i.e. non-orthogonality) between interacting modes underlies the emergence of such single-rod resonances [2].

Potential applications in (Fano) LSP sensing are discussed that exploit the simplicity of the required nanostructures, resulting in turn in large figures of merit [3]. In particular, two configurations are proposed based on elongated nanorods: colloidal nanorice and nanobelts on a substrate (see Fig. 2).

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