Light and Plasmons on topological nanoparticles

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A key feature of topological insulators is the presence of surface states immune to disorder and impurities due to topological protection. These states modify the optical properties of topological insulators compared to their ordinary counterparts.

We show that topological insulators nanoparticles sustain a new kind of excitation when interacting with light. This is a topological localized surface plasmon polariton obtained perturbing the nanoparticle surface electron state with light. We report a previously unknown light-matter mode that was not revealed in earlier studies, which focused on bulk samples and thin films of topological insulators. In the nanoparticles the topologically protected surface states efficiently couple phonons and light giving rise to the topological particle polariton mode. In addition, the surface states can act as a screening layer which suppresses absorption inside the particle. These effects may be useful in the areas of plasmonics, cavity electrodynamics and quantum information.

On other hand, we will show that topological photonics particles, due to their finite size, support interesting localized plasmon-like resonances that explain particular features observed in recent experiments.

References

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