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LIMITS OF THE LIGHT SCATTERING BY SMALLMETALLIC PARTICLES USING EVOLUTIONARY TOPOLOGY OPTIMIZATION

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ABSTRACT. The interaction between light and subwavelength structures provide tailorable optical properties which can be useful in many engineering applications. These properties strongly depend on the material shape which provides obtaining unique scattering characteristics when rigorously designed. However, the conventional design methods require precise modeling and characterization of the shapes of the scattering objects, thus requiring a lot of intuition and knowledge about light radiation at small scales. We propose a framework to discover new nanoparticle designs for improved scattering based on topology optimization. The framework allows us to maximize scattering cross section of the particle domain. Increased scattering cross section at nano-scale leads to improved light trapping which is critical in many applications such as more efficient thin film solar cells. Topology optimization suggests a knowledge independent design procedure therefore revealing relationships between certain regions in the design domain and the light behavior for maximum scattering cross section.