Abstract

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Fundamentals of designing Cylindrical High Order Transformation Optics Invisibility Cloaks using Silver-Silica Metamaterials

Metamaterials have effective properties that are distinct from their composites as they consist of engineered-designed properties that are not in nature. In order to be able to design a metamaterial, we should establish sufficient understanding of the properties of the constituents. This will enable us to engineer new effective parameters of the metamaterial. We shall perform a detailed analytical study for the effective parameters and the constituents' parameters of silver–silica metamaterial. This will define the optical response of the mixture at different sizes of the inclusions' and different volume fractions of the silver and silica. Also an optimum value of the volume fraction is proposed to achieve a broadened resonance optical response. Finally, we propose the design technique and constraints of a non-magnetic optical cloaking device, based on high-order transformation optics with different volume fractions of silver and silica.