

Absolute negative refraction and image of unpolarized electromagnetic wave

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The all-angle negative refraction (AANR) is generally very important to design a microsuperlens. However, it is usually absent from some two-dimensional (2D) photonic crystals (PCs). In this work, we first present a method to create and enlarge the AANR region by using insertion. For some 2D dielectric PC systems without the AANR, the AANR region can be created by adding a fraction of a metallic component to the center of each dielectric cylinder. At the same time, the AANR region can be enlarged by adjusting the size of the metal cylinder. Based on these, absolute negative refraction for *both* polarizations of electromagnetic wave has been found. Thus, the focusing and images of unpolarized light can be realized by such a two-dimensional photonic-crystal-based superlens. These focusing and images do not only exist in the near-field region. The non-near-field images, explicitly following the well-known wave-beam negative refraction law, have been demonstrated. In addition, the effects of interface, disorder and absorption on such far-field image in a two-dimensional photonic-crystal-based superlens have also been discussed.