

NEGATIVE REFRACTION: AN INTRINSIC PROPERTY OF UNIAXIAL CRYSTALS

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We theoretically and experimentally show that negative refraction can be realized at the surface of conventional uniaxial crystals by orientating the crystals with their optic axes at a certain angle θ_0 to the normal of the light incoming surface. The concept of negative refraction can be extended to be an intrinsic property of all uniaxial crystals. It is revealed that the angular range for incident light to yield negative refraction attains its maximum that only depends on the difference of two indices of refraction $|n_e - n_o|$ when $\tan^2 \theta_0 = n_o / n_e$. The careful experiments on positive uniaxial crystal YVO_4 and negative uniaxial crystal calcite (CaCO_3) give results in good agreement with the calculated ones. It should be noted that the negative refraction reported here differs from that occurring in metamaterials or photonic crystals in that the wave vector of light k in conventional crystals does not form a left-handed triplet with electromagnetic field E and H .

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