Radiative force induces electrostatic potential in metallic photonic crystal slab

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In 2004, one of the authors published the first report on photo-induced voltage across metallic photonic crystal slabs (PCS). The voltage changes in amplitude and sign depending on wavelength and incident angle. This time we present an intuitive picture based on momentum conservation. When a PCS is irradiated by incident light, shear force is given in general as a recoil of diffraction. In metallic PCS, free electrons receive this force. As a result, electrostatic potential is developed in metallic PCS which can be measured as voltage. We analyze our experimental results from this point of view.

[1] T. Ishihara, "Optical response of semiconductor and metal-embedded photonic crystal slabs", physica status solidi (a) 201, 394-404(2004).