Enhancing Optical Activity with Strongly Coupled Planar Chiral Metamolecules

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Magneto-electric coupling in chiral media gives rise to optical rotation and circular dichroism [1]. Since its discovery, optical activity has been applied in many disciplines of science including chemistry, biology and physics. Because naturally-existing chiral materials exhibit very weak chirality, it is essential to design artificial chiral media with strong rotatory power. Recently, in an attempt to achieve strong chirality, several types of chiral metamaterials have been proposed [2,3]. However, there are still limitations in enhancing chirality with precious approaches. With numerical simulations and microwave experiments, we demonstrate that a strong capacitive coupling between metamolecules can give a significant enhancement in chirality along with reduced ellipticity.

Fig. 1: (a) Schematic view of the unit cell structure and photograph of the strongly-coupled metamolecule structure. Simulated and experimentally-extracted (a) chirality $\kappa$ and (b) ellipticity $\eta$.

References