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Hyperbolic dispersion of graded anisotropic metamaterial with optical Kerr effect KA SHING HUI, HON PING LEE, KIN WAH YU, The Chinese University of Hong Kong — We have investigated the tunable optical dispersion relation from an anisotropic graded material with optical Kerr effect under the influence of external electric field. The permittivity of the material depends on incident electric field $\tilde{\epsilon} = \epsilon + \chi|E|^2$. In particular, a graded metallic thin film which dielectric permittivity is anisotropic in the parallel and perpendicular directions is considered. The permittivity in parallel direction is described by the graded Drude model and the permittivity in the perpendicular direction is described by epsilon-near-zero (ENZ) metamaterial. For ENZ metamaterial, the local electric field is enhanced such that $\chi|E|^2 \sim \epsilon$. As a result, the permittivity of ENZ metamaterial can be tuned by the optical Kerr effect. The dispersion relation and the electric field distribution are also examined in the quasi-static condition. By varying the intensity of the incident electric field, the dispersion relation can be switched from elliptical to hyperbolic which allow us to control light prorogation. Furthermore, the implication of the switching from the elliptical to hyperbolic dispersion on the Goos-Hänchen shift will be studied.

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