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(G*) Exceptional points in helically structured thin films

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Thin film deposition on substrates inclined with respect to the flux of evaporated materials can be used to produce anisotropic porous nanostructures displaying effective anisotropic optical properties at the wavelength scale. When the orientation of the substrate is changed during the deposition process, sculptured thin films are grown, whose optical properties can be continuously controlled during the deposition along the direction normal to the substrate. Helically structured thin films are an example of such material. They give rise to a circular Bragg resonance at a soecific wavelength λ. Here we report about the existence of exceptional points (EPs), where the eigenpolarization states in reflection coalesce into a single state at specific orientations of the k vector of the incoming beam. Such EPs were previously reported for metasurfaces; here we show that they can also be realized by using conventional thin film deposition methods and thus lend themselves to low cost manufacturing. Laser mirrors based on helically structured thin films with EPS can be used to create only one eigenstate of polarization inside a resonator and thus eliminate dual polarization states, or to eliminate spatial hole burning in standing wave resonators.

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