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Optical Signatures of Disordered Materials[1] HERGEN EILERS, BENJAMIN ANDERSON, RAY GUNAWIDJAJA, Washington State University — Many security applications require tamper-indicating seals for authenticity verification. Recent approaches focus on storing information (anti-evidence) at the time of seal preparation. Missing anti-evidence indicates that tampering occurred. We design, prepare, characterize, and evaluate optically disordered materials for potential authentication applications. These materials consist of composites containing polymers, scattering particles, and sometimes fluorescent dyes. We then use a spatial light modulator to modulate the phase of a laser beam in conjunction with a microgenetic-algorithm-based feedback loop to identify a unique optical signature for the disordered material. Reflectance, transmittance, fluorescence, random lasing, and many other approaches can be used to determine an optical signature for the disordered material. Tampering will disturb the specific disorder of the material and destroy the optical signatures. For remote applications, this approach can be combined with quantum-secure approaches. We will present modeling and experimental results for transmission and reflectance measurements, including focusing light through optically-opaque materials.

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