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Optical Properties of Reactive Magnetron Sputtered Aluminum Nitride for use in Hyperbolic Metamaterials RACHEL ADAMS[1], Department of Mechanical Engineering, University of Dayton, SAID ELHAMRI, HADLEY SMITH, Department of Physics, University of Dayton, MADELYN HILL, ZACHERY BIEGLER[2], KURT EYINK, AMBER REED, Materials and Manufacturing Directorate, Air Force Research Laboratory — Incorporating single photon emitters into practical applications is currently restricted by their low efficiency; this efficiency can be enhanced by coupling single photon emitters with plasmonic nanostructures. Hyperbolic metamaterials (HMMs) of metallic and dielectric nitrides are promising plasmonic nanostructures in the visible to near-IR range due to high temperature applications. Dielectric materials such as aluminum nitride (AlN) are of interest for creating HMMs when layered with a metallic material. In this work, the effects of growth parametersnitrogen gas fraction, gas ion flux to metal neutral flux ratio, substrate temperature, and sputter poweron the microstructure, surface morphology, and optical properties of AlN are investigated. The AlN films in this study were deposited using reactive controllably unbalanced magnetron sputtering. X-ray diffraction was used to characterize the crystallinity and atomic force microscopy was used to determine the surface morphology of the films. The optical properties were determined by spectroscopic ellipsometry.

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