The electrostatic self-assembly of multilayer thin films by alternate adsorption from polyelectrolyte solutions spontaneously leads to the formation of noncentrosymmetric structures if the molecules themselves have net dipole moments. Significant second-order nonlinear optical susceptibility has been observed in such films, using both commercially available chromophores and molecules specifically designed to yield an enhanced net dipole moment. Recent results indicate the capability to fabricate piezoelectric films using the same method. The inherent ordered nature of ESA films yielded extremely stable noncentrosymmetric thin films for second-order nonlinear optical applications. The ESA technique offers numerous advantages over conventional thin film fabrication methods and offers great potential in commercial applications such as reflectance and AR filters, EO waveguides and modulators and other optoelectronic devices.

The structure of each monolayer in ESA films is dependent on the processing parameters, producing subsequent variations in bulk film properties both intentionally and incidentally. As this method is still in its infancy, variations in ESA processing methods, including process automation, are considered first in this document. These results allowed carefully controlled refractive index experiments and the synthesis of both step and graded index structures, several microns thick. Dielectric stack, Rugate, and antireflection optical interference filters were designed, synthesized and demonstrated. c(2) films of both commercially available polymer dyes and novel polymers designed specifically for the ESA process were demonstrated using second harmonic generation. UV/vis spectroscopy, ellipsometry and atomic force microscopy analysis are presented.
the wavelength range from 300 to 2500 nm. The refractive index has been found to increase with increasing Co content. It was further found that optical energy gap decreases from 3.28 to 3.03 eV with increasing Co content from \( x = 0 \) to \( x = 0.10 \), respectively. The nonlinear refractive index of the Zn\((1-x)\) Co\(x\)O thin films was calculated and revealed well correlation with the linear refractive index and WDD parameters which in turn depend on the density and molar volume of the system. Keywords: Crystallite Size Optical Constant Nonlinear Refractive Index Linear Refractive Index Thermal Evaporation Technique.