**Supporting Information**

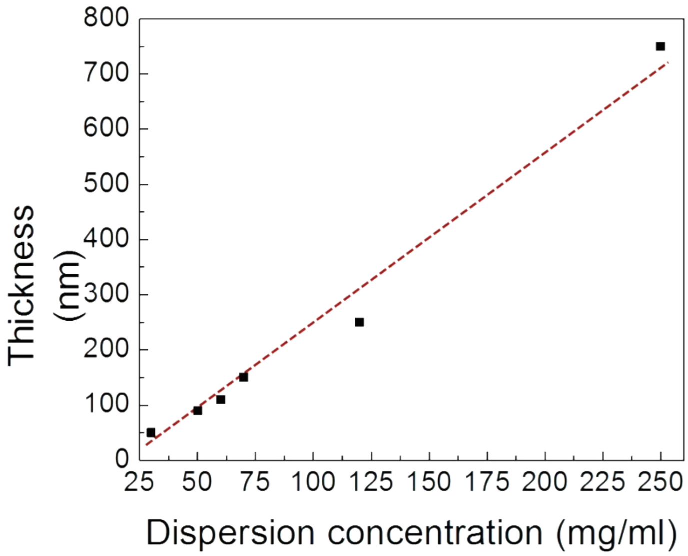


**Figure S1.** Thin film thickness (from cross-sectional SEM analysis) *vs*. concentrations of dispersions. The dashed line is a guide to the eye to show the linear dependence.

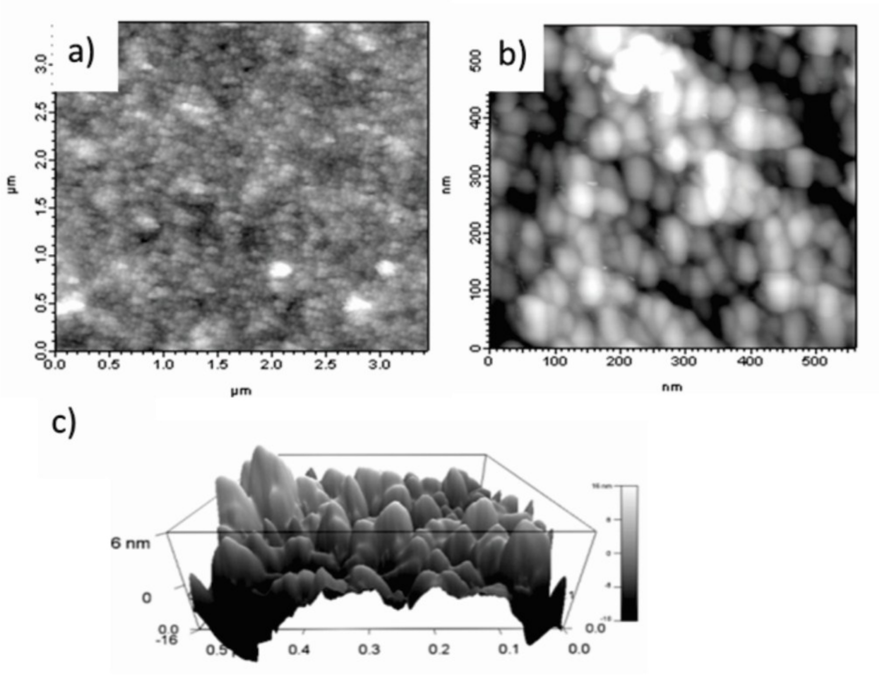


**Figure S2.** Height retrace of a) 5 µm × 5 µm and b) 500 nm × 500 nm scanned area of $BaTiO_3$ thin films of 3 µm thickness, c) 3-D height retrace image of (b).

**Optical characteristics of $BaTiO_3$ nanoparticle films made from different concentrations of initial nanoparticle dispersions.** All the films exhibit more than 90% transparency above 500 nm range and therefore are of good optical quality (Fig. S3a). The optical constants (refractive index n and absorption coefficient k) of the films are calculated from the Kramers-Kronig transformations of their reflectance spectra (Fig. S4). The refractive index of the films at 632 nm is 1.8 for the films fabricated from 120 mg/ml dispersion concentration and 1.5 for the other set of films. The absorption coefficient of the films are set to 0 above 500 nm due to their high transparency (Fig. S3b). From the refractive index data (Fig. S3b), the density of the films is approximated using the Lorentz-Lorenz relation[1] and estimated to be 76% (dispersion concentration of 120 mg/ml) and 63% (dispersion concentration of 60 mg/ml), respectively, at a sintering temperature of 700 $^{o}$C. For comparison, a literature value of 2.4[2] for the refractive index of $BaTiO_3$ at 632 nm was taken. Based on these results, it is obvious that films of different porosity and refractive index can be manufactured by adjusting the initial concentration of the nanoparticle dispersions. Such fabrication flexibility has implications on distributed Bragg reflectors and gradient refractive index coatings. Moreover, the porosity of the films can easily be tuned, facilitating impregnation of liquids to further modify the refractive index.

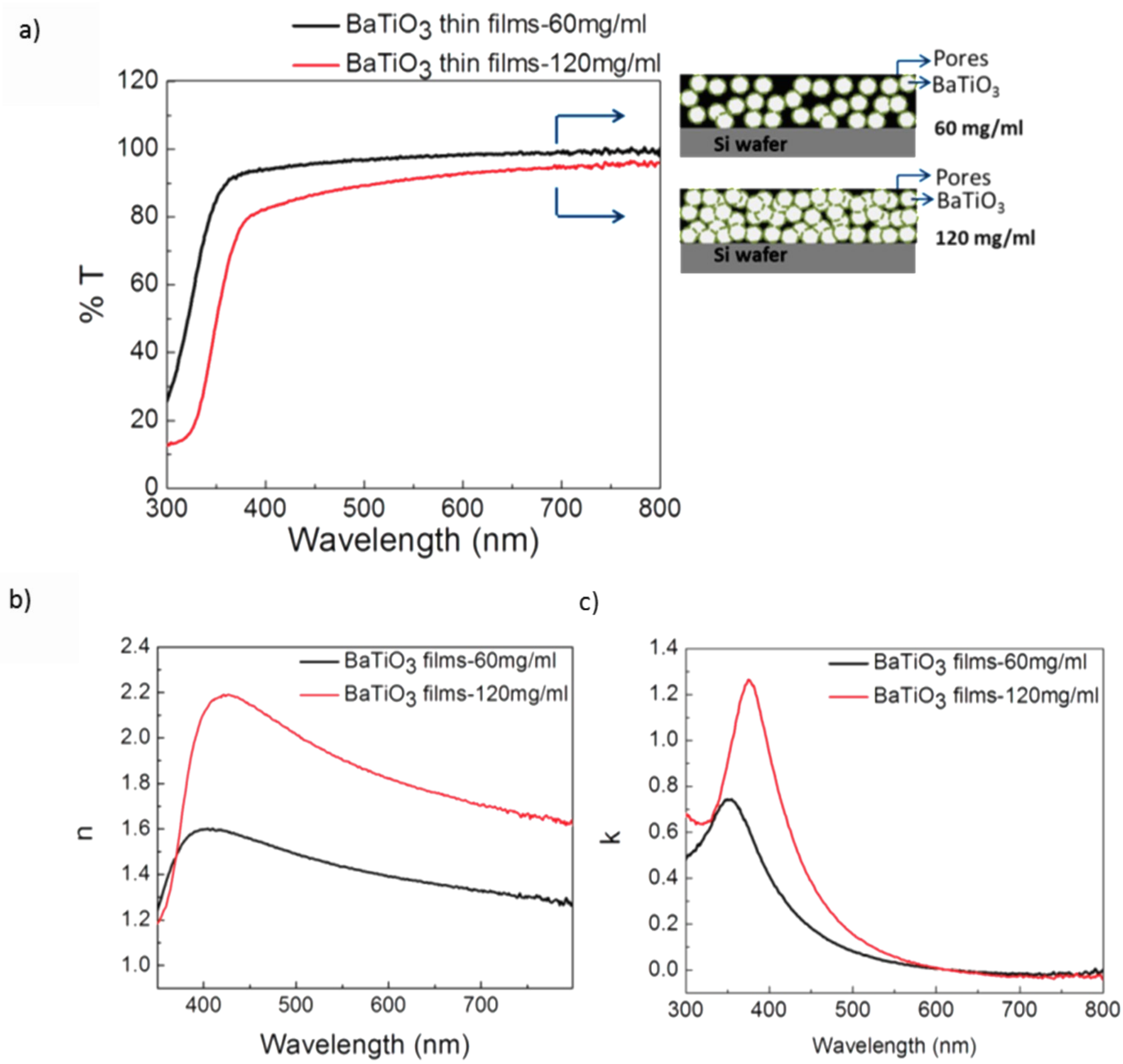


**Figure S3.** a) UV-*vis* spectra, b) refractive index (n) and c) extinction coefficient (k) of $BaTiO_3$ nanoparticle thin films of 120 mg/ml and 60 mg/ml dispersion concentrations.

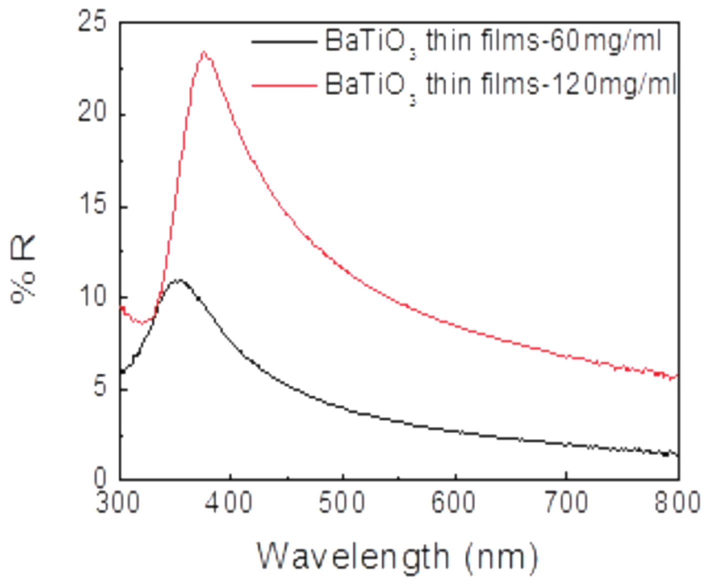


**Figure S4.** Reflectance spectra of $BaTiO_3$ thin films fabricated from initial nanoparticle dispersions of 60 and 120 mg/ml concentrations.

**References**


1. Mergel, D., Modeling thin $TiO_2$ films of various densities as an effective optical medium. *Thin Solid Films* **2001,** 397, (1–2), 216-222.
2. Basantakumar Sharma, H., Structural and optical properties of sol-gel derived barium titanate thin film *Int J. Mod Phys B* **2007,** 21, (11), 1837-1849.