Control of Molecular Orientation in Solution-Cast Films of Cellulose Esters and Its Application to Optical Functional Films

Abstract. Cellulose esters are highly potential materials as an ideal optical film. They can be produced by solution-cast method which provides the film without molecular orientation in the film plane. The level of the birefringence in cast films depends on the preparation conditions. Moreover, the orientation birefringence in cellulose esters is found to be determined by the type and amount of the ester groups rather than the main chains. Certain types of cellulose esters such as cellulose acetate propionate (CAP) and cellulose acetate butyrate (CAB) were found to exhibit the positive in-plane and out-of-plane birefringences with extraordinary wavelength dispersion, a property essential for wideband retardation films. It is also demonstrated that three-dimensional refractive indices and wavelength dispersion of birefringence in cellulose esters can be altered by the addition of a small amount of an appropriate low-mass compound such as tricresyl phosphate (TCP). A phenomenon in which low-mass compounds are forced to orient to the same direction by the alignment of polymer chains due to the intermolecular orientation coupling which is called as the nematic interaction. This will be a key technology in the field of high-performance optical films to improve the contrast of LCD, because there are numerous low-mass compounds having strong polarizability anisotropy.

Keywords: Cellulose esters, Optical functional film, Wavelength dispersion, Solution-cast, Nematic interaction