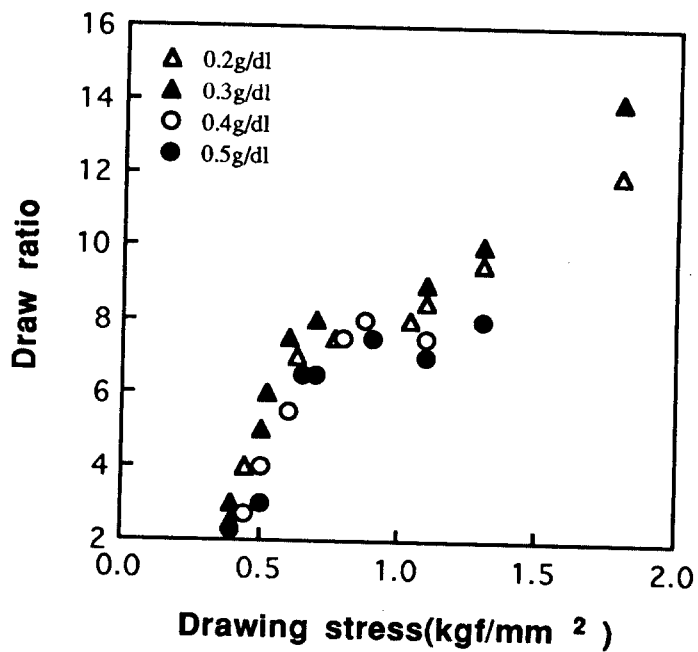


# Determination of Optimum Polymer Concentration by Zone Drawing Method in Syndiotacticity-Rich Ultrahigh Molecular Weight Poly(vinyl Alcohol) Film Casting

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A new method using simple zone drawing technique was suggested for determining the optimum initial concentration of polymer solution which has suitable macromolecular entanglements. This method was developed to replace the incorrect inherent viscosity measuring method for syndiotacticity-rich (syndiotactic diad content of 63.4%) ultrahigh molecular weight (number-average degree of polymerization of 12,300) (UHMW) poly(vinyl alcohol) (PVA) solution. Syndiotacticity-rich UHMW PVA films were prepared from dimethyl sulfoxide (DMSO) solutions with different concentrations of 0.2, 0.3, 0.4, and 0.5g/dl. In order to investigate the drawing behavior of the syndiotacticity-rich UHMW PVA films with different solution concentrations, the films were drawn under various zone drawing conditions. Through a series of experiments, it turned out that the initial concentration of PVA solution in DMSO caused significant changes in the draw ratio of the syndiotacticity-rich UHMW PVA film. That is, the one-step zone draw ratio of the film at initial concentration of 0.3g/dl exhibited its maximum value and gradually decreased at higher or lower concentrations (Figure 1). Thus, it was disclosed that the initial concentration of 0.3g/dl is the optimum polymer concentration to produce maximum draw ratio in this work. Based on the above results, it may be concluded that the optimum concentration of the initial PVA solution can be determined directly by measuring the zone draw ratio.



**Figure 1.** Draw ratio dependence on the concentration of syndiotacticity-rich UHMW PVA solution at gradual zone drawing stress.