



PL-8- James L. White Award

**DEVELOPMENT OF HIGHLY TRANSPARENT POLYPROPYLENE SHEETS**

Akira Funaki A, Toshitaka Kanai A\*, Kaname Kondo B, Hiroshi Odaka B

*a*Performance Materials Laboratories, Idemitsu Kosan Co., Ltd 1-1, Anesaki-Kaigan, Ichihara, Chiba, 299-0193, Japan and *b* R&D Center for Plastic Products, Idemitsu Unitech Co., Ltd. 1660, Kamiizumi, Sodegaura, Chiba, 299-0205, Japan

In order to obtain highly transparent isotactic polypropylene (PP) sheets by an industrial process, various factors contributing to transparency were analyzed. At first, the observation was experimentally conducted by using many screws with various geometries. The transparency of melted web was obtained by the screw geometry so that the specific energy consumption was small. Then the higher order structure of the higher tacticity PP sheets was investigated. After the heat treatment of quick quenched sheets, the matrix was transformed from smectic structure to  $\alpha$ -monoclinic crystal phase. The density and refractive index differences between spherulite and matrix were decreased, and the transparency was drastically improved. Additionally, the influence of the isotacticity, molecular weight distribution, crystallization control material and multilayer extrusion process were analyzed. The lower tacticity PP generated the less and the smaller size of spherulites and showed the improvement behavior on transparency by heat treatment. In the case of addition of L-LDPE with the specific density to PP, the transparency was markedly improved by the heat treatment. This phenomenon could be explained by the refractive index difference of PP matrix and the fine distribution particles of L-LDPE. The shear stress was reduced by laminating resin with low melt viscosity on both surfaces, and therefore it can be surmised that the stress induced crystallization was restrained.