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**The Effect of Nanoparticles on Selective Gas Permeability of Thin Film Membranes Using Supercritical Fluid** A. HO, R. ROSENFELD, Hebrew Academy of the Five Towns & Rochway, J. JEROME, Stony Brook University, Y.-S. SEO, T. KOGA, M. BRONNER, J. SOKOLOV, Stony Brook University, M. RAFAILOVICH, Stony Brook University — The addition of inorganic nanoparticles to polymer thin films can be highly beneficial to their lubrication, strength, and UV resistance. Since nanoparticles are rigid, they do not conform to the molecular order of the film, producing nano-scale voids. Consequently, the introduction of nanoparticles into polymer films alters their porosity and this phenomenon may be exploited to engineer selectively permeable membranes. Porosity can also be introduced by swelling the films in supercritical fluids and then rapidly removing the solvent by decreasing the pressure which converts the solvent to the gas state. In order to test this hypothesis, solutions were made of nanoparticles, clay or gold, with polystyrene or poly (methyl methacrylate) polymer to observe the change in porosity and to analyze its dependence on polymer structure and on polymer nanoparticles interactions. Samples were exposed to  $\text{ScCO}_2$  at two different temperatures and pressures of  $36^\circ\text{C}$ , 1200psi and  $50^\circ\text{C}$ , 1450psi. We then measured the permeability of  $\text{O}_2$  and  $\text{CO}_2$  gas. We found that exposure to supercritical  $\text{CO}_2$  greatly increased the permeability to both  $\text{O}_2$  and  $\text{CO}_2$  gas. The degree of change in permeability in the nano-composite film depended on the particle aspect ratio and intensity in the matrix.

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