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Relationship between the peel strength and microdomain orientation in the interfacial region for a block copolymer-based pressure-sensitive adhesive

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We have investigated the relationship between the peel strength of a block copolymer-based pressure-sensitive adhesive comprising of the poly(methyl methacrylate) (PMMA) and poly(*n*-butyl acrylate) (PnBA) components from the substrate, and the structural change of microdomains in the interfacial region between the adhesive and the substrate, which is due to the attachment of the adhesive to the substrate. For the PMMA substrate, the PMMA component in the adhesive with a strong interaction to the substrate is attached to the surface of the substrate during an annealing process of the sample at 140 °C. Next, the PMMA layer adjacent to the substrate surface is overlaid with the PnBA layer covalently connected to the PMMA one, resulting in the horizontal alignment of the lamellae in the interfacial region. The peel strength of the adhesive substantially increases during annealing at 140 °C, which takes the same time as the completion of the horizontally oriented lamellar structure. On the other hand, in the case of polystyrene (PS) substrate, both the components in the

adhesive repel the substrate, leading to the formation of the vertically oriented lamellar structure. That is to say, the PS substrate plays a role as a neutral substrate for both the components. As a result, the peel strength of the adhesive with respect to the PS substrate does not entirely increase on annealing. It is considered that the peel strength of the adhesive is highly correlated to the interfacial energy between the adhesive and substrate, which can be estimated from the microdomain orientation in the interfacial region.

Biography

Tsukasa Miyazaki is a researcher of polymer science fields and a manager of Utilization Promotion Division and Neutron R&D Division in CROSS. His Research includes Polymer Physics, Thin Polymer Films, Neutron and X-ray Scattering and Reflectivity, Industrial Applications of Polymer Science and Technology

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