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Polymer nano-adhesion promoted by surface mobility KEIJI TANAKA, TOSHIHIKO NAGAMURA, Kyushu University, KYUSHU UNIVERSITY TEAM — We here propose a novel nano-adhesion technique on the basis of enhanced surface mobility in polymer films. As materials, monodisperse polystyrene and deuterated polystyrene (PS and dPS) with number average molecular weight of 29k were used. The surface and bulk glass transition temperatures were 294 and 373 K, respectively. PS bilayers were prepared, and were annealed at a temperature between the surface and bulk Tgs for a given time. Then, interfacial adhesion strength (G) was measured. In addition, adhesion measurement by a scanning force microscope using a probe tip covered with the PS layer was made. In this case, the adhesion area was also on nanometer level. Hence, this experiment is denoted as nano-adhesion hereafter. For both experiments, G value first increased with increasing time and then reached a constant. This implies that segments moved across the interface even at a temperature below the bulk Tg and thus adhesion took place at the interface. To confirm this, the interfacial evolution for the (PS/dPS) bilayers was examined by dynamic secondary ion mass spectroscopy. Since G value was linearly proportional to interfacial thickness, it was claimed that the adhesion at the bilayer interface was mainly governed by the interfacial thickening. Interestingly, G value by nano-adhesion measurement was much larger than that for a bilayer at a given time. The difference can be explained in terms of the completeness of the interfacial formation.

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