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Inclusion Kinetics of Polyrotaxanes HIDEAKI YOKOYAMA, SHOKO TAKAHASHI, KOHZO ITO, The University of Tokyo, NORIFUMI YAMADA, High Energy Accelerator Research Organization, KEK — Inclusion complex (IC) formation of α-cyclodextrin (α-CD) and poly(ethylene glycol) (PEG) brush in water was investigated by Surface Plasmon Resonance Spectroscopy(SPR), neutron reflectometry(NR) and grazing incident wide angle X-ray scattering(GISANS). Spontaneous IC formation of α-CD with PEG (polyrotaxanes) is believed to be due to hydrophobic interaction between the hydrophobic interior of α-CD and PEG; however, the detail of the IC formation kinetics has not been observed because IC formation results in aggregation and precipitation of the complex. SPR revealed that IC formation occurs after induction period, which often appears in crystallization. When concentration of α-CD solution is 10%, IC consisting randomly oriented α-CD polycrystal appeared. In contrast, when the concentration of α-CD solution is 5%, a uniform 10-nm-thick IC layer with α-CD stacked perpendicular to the substrate appeared. 10-nm-thick IC was also found in the diluted PEG brush in contact with a 10% α-CD solution. The characteristic 10-nm-thick layer is related to the folded crystalline structure of α-CD on PEG brush. Such crystallization was proved to be the main driving force for IC formation.

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