

高引き裂き耐性を有するラテックスフィルムの創製

Latex Film with High Crack Resistance

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Abstract

Latex films composed of polymer nanoparticles are considered as an environmentally friendly material since almost no organic solvents are used. However, the low mechanical properties of the film limit its functionality in many applications. In this study, we discovered crack-blunted tough elastomer films composed of rotaxane-crosslinked polymer nanoparticles. Under the tear tests of the rotaxane-crosslinked nanoparticle-based films with notch, the direction of crack propagation changed from a parallel to perpendicular to the pre-crack, which is unusual behavior exhibited in latex films. Nanostructural analysis using X-ray scattering and the deformation rate dependence of the tear test revealed that crack propagation is slowed down under the appropriate amount of rotaxane and deformation rate, indicating that rotaxane is effective in toughening these films. Furthermore, these latex films can be degradable only by immersing in a good solvent. These results on both the toughening and degradability of waterborne latex coatings utilizing nanoparticles will help to broaden the design of new types of functional waterborne coatings.

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1. はじめに

直径がサブミクロンから数マイクロメートル程度で水に分散した高分子微粒子は、大きな比表面積や高い分散安定性を有し、触媒や医薬品

のほか、エネルギーやエレクトロニクス分野にも応用される機能性ナノマテリアルである¹⁻²⁾。そのような高分子微粒子は、近年は単一微粒子としての応用も見出されているだけでなく、集積体であるラテックスフィルムも、塗装などに

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