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MOLECULAR DESIGN AND FUNCTIONALITY OF BRANCHED POLYMERS

YUSUKE KAWAKAMI

*Graduate School of Materials Science, Japan Advanced Institute of Science and Technology, Hokuriku,
 Asahidai 15, Tatsunokuchi, Ishikawa 923-12, Japan*

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1. INTRODUCTION

Since the discovery of nylon and polyolefins around the middle of this century, many polymeric materials have been introduced and used in wide areas of our daily life. Although polymeric materials have now taken their place as one of the three basic classes of structural materials (the others are metals and ceramics) and have the advantages of light weight and easy processing, their use is limited by their poor resistance to high temperatures and their typically low mechanical strength. Polymeric materials have been mainly used alone until quite recently. They often cannot meet a wide variety of requirements, especially combinations of requirements, even though some show excellent ability to meet each specific requirement by itself. Efforts have been made to meet such conflicting combinations of requirements by making multi-component polymer blends from polymers with different properties. Although blending polymers is still one of the major methods to meet combinations of requirements on polymers, one of the major drawbacks about most polymer blends is the generally observed incompatibility of the component polymers. Phase separation of the component polymers results in poor properties of the blend.

One possible solution to avoid phase separation is to make block or graft copolymers in which two or more polymer components are linked through chemical bonding. Polymer components constituting block or graft copolymers might phase separate.