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指導教員 承認印	㊞	㊞	㊞

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論文提出者	生物システム応用科学府 生物システム応用科学 専攻 博士後期課程　生物機能システム科学専攻　専修/グループ 平成 28 年度入学 氏名 NUR AZRINI BINTI RAMLEE ㊞

主指導教員 氏　名	富永 洋一	副指導教員 氏　名	荻野 賢司	副指導教員 氏　名	

論文題目	Physicochemical and degradation properties of poly(ethylene carbonate)/poly(lactic acid) blends

論文要旨 (和文要旨(2000 字程度)または英文要旨(500words))
※欧文・和文どちらでもよい。但し、和文の場合は英訳を付すこと。

In chapter 1, the great effort in fulfilling the environmental concerns and rapidly increasing demand for biobased/biodegradable polymers to suit in the applications such as packaging, biomedicals, textiles, and others have been highlighted, focusing on poly(lactic acid) (PLA). Interests in PLA modifications are still growing following low toughness and biodegradability due to brittleness and slow degradation upon hydrolysis, respectively. In the past years, many attempts have been made to improve PLA toughness and biodegradability with various modification approaches, but the properties of modified PLA such as mechanical strength and degradability are still limited by the miscibility, phases morphology and non-biodegradable additives. In this study, poly(ethylene carbonate) (PEC)/poly(lactic acid) (PLA) blends were developed. PEC can be synthesized by the alternating copolymerization of carbon dioxide (CO_2) with epoxides, and it contains high stress-strain hardening and possesses better degradability properties, and to some extent, PEC and PLA are compatible due to the chemical structure resemblances.

In chapter 2, the preparation and characterization of PEC/PLA blends at various blend ratios have been investigated. In the previous study, added PEC to poly(vinyl chloride) (PVC) blend system offers good performance as a renewable additive (since it synthesized from CO_2), especially when the PVC has a high toxicity level as for material that is vastly used in toys and packaging products. Recently, an improvement in oxygen permeability has also been reported, suggesting the PEC/PLA blends could be an alternative eco-friendly packaging material, nevertheless, the introduction of PEC at high temperature tendency to affect the blend profiles and no further characterization of degradability for PEC/PLA blends was done in this study. The effect of different blend ratios PEC and PLA and the simple solution casting preparation were investigated in generating PEC/PLA blends alternatively.

In chapter 3, the PEC properties that combine the advantages of large stress-strain hardening and fast degradation rate have been explored. The present study examines the effect of the low content PEC on the enhancement of tensile toughness and degradation in alkaline solution properties of PLA. No studies have previously been conducted. Partial miscible PEC/PLA blends show improved tensile toughness and PEC increased the degradability of PLA in the alkaline solution.

In chapter 4, an additional melt-quench technique was introduced to the PEC/PLA blends (as cast) that have advantages to forming a change to phase morphology. Thus, may give rise to structural, mechanical, and thermal properties. The melt-quench process has been employed with poly(vinylidene fluoride) (PVDF)/poly(methyl methacrylate) (PMMA) blends, resulting in non-lamellar (micellar) crystallites due to the crystallization of polymers with extensive super cooling that changes the phase morphology.

In chapter 5, all findings were summarized to a conclusion. PEC/PLA blends were successfully developed, and the blends showed improvement for tensile toughness and degradability in the alkaline solution. Thermal stability of these blends allows for other melt-quench change, decreasing the % PLA crystallinity and influenced the mechanical properties. Addition of PEC to PLA is for seen an easy strategy for creating a new PLA binary system with biodegradable polymer with well-defined physicochemical and degradation properties.

(英訳) ※和文要旨の場合(300 words)