Summary(English)

The paper explores the development of sustainable materials, focusing on the creation of self-healing polymers as an alternative approach to mitigate the environmental impact of persistent synthetic materials. It highlights the challenges posed by the slow degradation of man-made polymers and emphasizes the importance of innovative strategies to address this issue. The research aims to design polymers with extended lifespans or the ability to repair themselves after damage, thus minimizing the need for frequent replacement.

The primary focus of the study is on the development and characterization of self-healing copolymers based on non-covalent van der Waals interactions. By synthesizing copolymers of methyl methacrylate (MMA) and butyl acrylate (BA), the authors demonstrate efficient self-repair capabilities within a narrow compositional window. The experiments reveal that copolymers with alternating sequences of MMA and BA units exhibit superior healing efficiency due to interdigitating alkyl pendant groups and interchain van der Waals forces.

The research methodology involves the synthesis of copolymers, characterization of material properties, analysis of microstructure, and investigation of intermolecular interactions. Through experimental observations and modeling analyses, the study elucidates the role of chain conformation and microstructure in facilitating self-healing behavior.

In conclusion, the study presents a promising approach to the development of self-healing polymers using commercially available monomers and leveraging non-covalent interactions. It underscores the importance of molecular structure in addressing longstanding challenges in materials science and offers insights into the design of next-generation sustainable materials.

中文

该论文探讨了可持续材料的开发，重点关注了自愈合聚合物的创建，作为缓解持久性合成材料对环境影响的替代方法。论文强调了人造聚合物缓慢降解所带来的挑战，并强调了创新策略在解决这一问题中的重要性。该研究旨在设计具有更长寿命或在受损后能够自行修复的聚合物，从而最小化对频繁更换的需求。

研究的主要重点是开发和表征基于非共价范德华力相互作用的自愈合共聚物。通过合成甲基丙烯酸甲酯（MMA）和丙烯酸丁酯（BA）的共聚物，作者展示了在狭窄的组成窗口内具有高效的自愈合能力。实验结果表明，具有交替的MMA和BA单元序列的共聚物由于分子间范德华力作用和交错的烷基偏基团而表现出卓越的自愈合效率。

研究方法包括合成共聚物、表征材料性质、分析微观结构以及研究分子间相互作用。通过实验观察和建模分析，研究阐明了链构象和微观结构在促进自愈合行为中的作用。

总的来说，该研究提出了一种有前景的方法，利用商业上可获得的单体和非共价相互作用开发自愈合聚合物。论文强调了分子结构在解决材料科学中长期存在的挑战中的重要性，并为下一代可持续材料的设计提供了见解。