

附件四、技術說明表



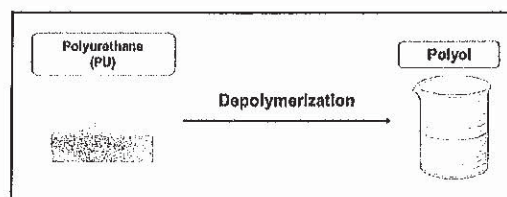
聚氨酯的低溫解聚方法

提案人：吳嘉文 教授

單位：國立臺灣大學 化學工程學系/研究所

簡歷：

Kevin Wu lab 網站:<https://fnnkevinwu.wordpress.com/>



市場及需求：

- (1) 聚氨酯 (Polyurethane, PU)製程中有超過一半的初級能耗來自多元醇 (polyol) 生產，若僅依賴生質原料難以實現商業化。因此再生多元醇 (repolyol)被視為更具可行性的減碳策略，不僅能降低碳排與原料成本，也有助於提升企業永續的展現。
- (2) 廢棄聚氨酯泡棉的解聚再利用，可有效解決傳統焚燒及掩埋所產生之環境問題，具有資源循環及永續發展的潛力。

技術摘要(含成果)：

本技術針對聚氨酯材料難以回收的問題，開發出一套低溫、環保且高效率的解聚方法，利用綠色解聚劑快速分解 PU 結構，回收之再生多元醇可直接再應用於聚氨酯合成。此技術具備製程簡單、能耗低、安全性高等優勢，並適用於多種 PU 材料，具資源循環與減碳應用潛力。

優勢：

- (1) **低溫短時反應**：相較於過去傳統方法，本技術可以在低溫且短時間將聚氨酯解聚，大幅降低所需能耗。
- (2) **綠色安全的解聚劑**：所採用之解聚劑為生物可降解及無毒試劑，使製程更為環保且兼具安全性，符合當前對綠色製程之發展趨勢。
- (3) **直接回用的 repolyol**：解聚後之多元醇，不須經過繁雜的分離純化過程，可直接重新用作再生聚氨酯之原料。
- (4) **廣泛應用性**：本技術可應用於多種聚氨酯的解聚，如硬質泡棉、軟質泡棉、彈性纖維(Spandex)複合材料、防水塗層戶外用品等。

競爭產品：

- (1) 非本案之聚氨酯解聚技術

專利現況：

- (1) 本技術目前正在申請中。
- (2) 本研究團隊致力於廢棄塑膠處理技術，開發符合環保趨勢之永續應用。

聯絡方式(請不用填)：

臺大產學合作總中心

Tel: 02-3366-9945, E-mail: ordiac@ntu.edu.tw

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Method for Low Temperature Depolymerization of Polyurethane

PI : Prof. Kevin C.-W. Wu

Department of Chemical Engineering, National Taiwan University

Experience:

Kevin Wu lab website: <https://fnmkevinwu.wordpress.com/>

Market Needs:

- (1) Over half of the primary energy consumption in polyurethane (PU) production comes from polyol synthesis. Sole reliance on bio-based feedstocks is difficult to commercialize due to high costs and limited performance. Repolyol recovery is thus a more feasible decarbonization strategy, helping to reduce both carbon emissions and raw material costs while supporting corporate sustainability goals.
- (2) Depolymerization and reuse of waste PU foam offers an effective alternative to incineration and landfilling, addressing environmental concerns and enabling circular resource utilization.



Our Technology:

This technology addresses the recycling challenges of polyurethane (PU) by developing a low-temperature, eco-friendly, and highly efficient depolymerization process. A green depolymerizing agent is used to cleave the PU network, allowing rapid degradation and recovery of polyol, which can be directly reused in PU foaming processes. The method features simple operation, low energy consumption, high safety, and is applicable to a wide range of PU materials, making it a promising solution for circular economy and carbon reduction goals.

Strength:

- (1) **Low-temperature and short-reaction time:** Compared to conventional methods, this process achieves efficient depolymerization under mild conditions, significantly reducing energy demand.
- (2) **Green and safe depolymerizing agent:** The selected reagent is biodegradable and non-toxic, aligning with the current trend toward greener and safer chemical processes.
- (3) **Directly reusable repolyol:** The recovered polyol does not require complex purification and can be directly used in refoaming applications.
- (4) **Wide applicability:** This method is compatible with various PU materials, including rigid foam, flexible foam, spandex fibers, and waterproof coatings.

Competing Products:

- (1) Other PU depolymerization methods.

Intellectual Properties:

- (1) The technology is currently under patent application.
- (2) The research team focuses on waste plastic treatment technologies, aiming to develop sustainable solutions aligned with environmental trends.

Contact (do not need to fill out):

Center for Industry-Academia Collaboration, NTU

Tel: 02-3366-9945, E-mail: ordiac@ntu.edu.tw