



IIT MADRAS

Indian Institute of Technology Madras

Technology Transfer Office TTO - IPM Cell



Industrial Consultancy & Sponsored Research (IC&SR)

Metal-Free approach and Method for Synthesis of Polyesters IITM Technology Available for Licensing

PROBLEM STATEMENT

- The conventional methods for **synthesizing semi-aromatic polyesters** use a Ring Opening Copolymerization (ROCO) reaction with **monomers and organometallic catalysts**.
- This method is **unsafe and can lead to environmental and human health issues**.
- Metal catalysts are **prone to transformations**, such as **hydrolysis and alkylation**, and can cause chemical changes when in **contact with body fluids**.
- **Prior methods** do not adapt metal-free catalysts, and the synthesis of **organometallic catalysts is not cost-effective**.
- Therefore, an **improved metal-free approach is needed for the synthesis of poly(tBGE-alt-PA) copolymers**.

TECHNOLOGY CATEGORY MARKET

Technology: Metal free synthesis of polyester

Category: Chemistry & Chemical Analysis

Industry: Polymer

Application: Biomedical

Market: The global market size was reached **USD 716.83 billion in 2022** and is expected to reach around **USD 1,207.11 billion by the end of 2032**, growing at a compound annual growth rate (CAGR) of **5.4% from 2023 to 2032**

INTELLECTUAL PROPERTY

IITM IDF Ref. 1682

Patent No: IN 351891

TRL (Technology Readiness Level)

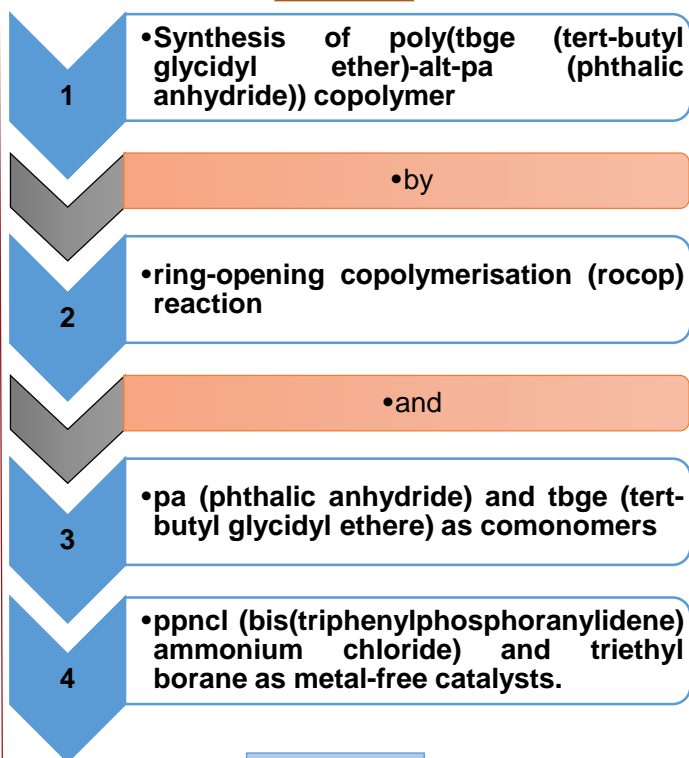
TRL- 4, Experimentally validated in Lab;

Research Lab

Prof. Rama S Verma - Dept. of Biotechnology &
Prof. Debashis Chakraborty - Dept. of Chemistry

TECHNOLOGY

Method



Polyester

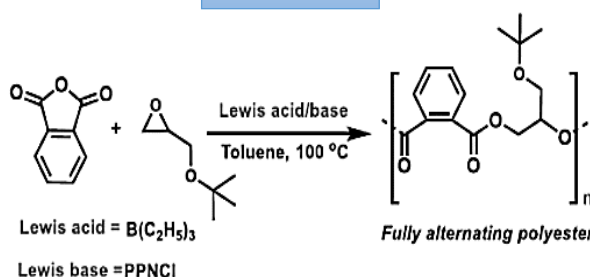


Fig 1 shows a fully alternating copolymerisation of PA with t-BGE by Lewis pair (LP)

CONTACT US

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Fig 2 shows a **water contact angle** of non-coated and poly(tBGE-alt-2 PA) copolymer coated glass surface

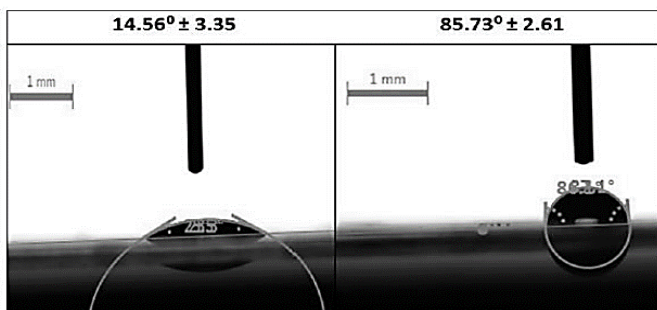


Fig 4 shows *in vitro* **biocompatible study** of poly(tBGE-alt-PA) copolymeric nanoparticles carried out by **MTT test** on HEK-293 and PBMCs in dose dependent manner for 72 hrs

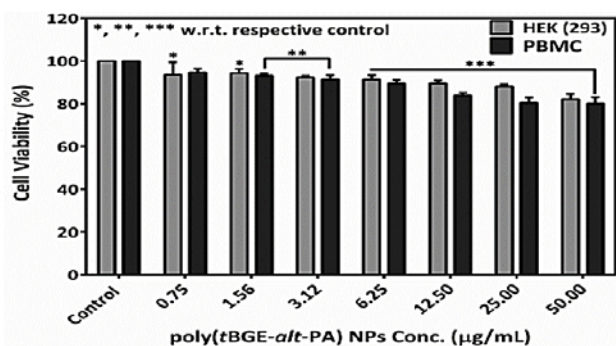


Fig 3 shows a **MALDI-TOF Mass spectrometry spectrum** of poly(tBGE-alt-PA) copolymer

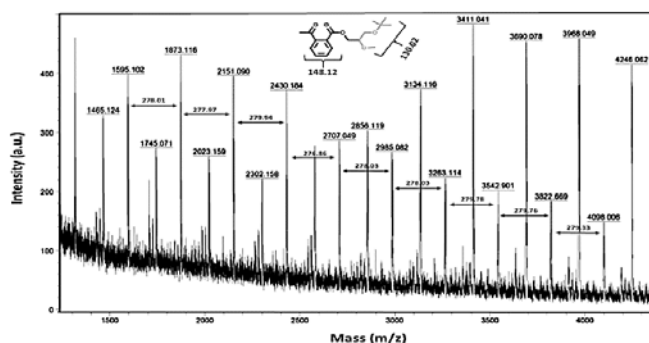
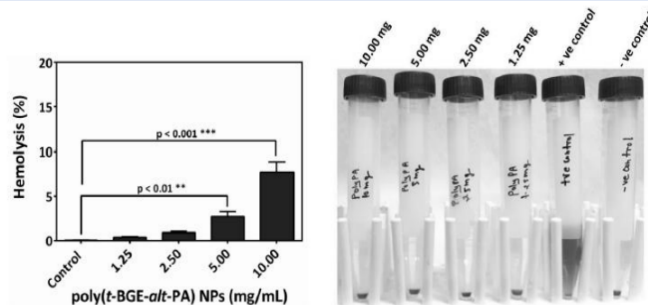


Fig 5 shows *in vitro* **hemolysis test** of poly(tBGE-alt-PA) copolymeric NPs carried out on **rat blood** with 2% RBC suspension



Key Features / Value Proposition

❖ Reaction vessel:

- ❖ Dry schlenk tube under argon atmosphere.

❖ Monomers:

- ❖ PA, tBGE, Et3B, PPNCI, immersed in oil bath at 100°C.

❖ Reaction

- ❖ Acetic acid solution quenched polymerization reaction.
- ❖ Precipitated copolymer dissolved in dichloromethane, precipitated with cold methanol.
- ❖ Dialysis with distilled water removed low molecular weight copolymer and unreacted monomer.

❖ Yield

- ❖ Poly(tBGE-alt-PA) copolymer synthesized via ROCOP reaction with over 99% yield.

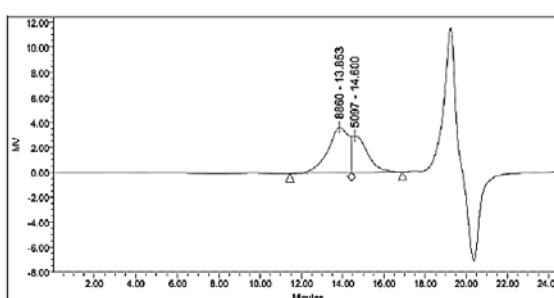
❖ Advantages

- ❖ Metal-Free Polyester Synthesis
- ❖ Eco-friendly and biocompatible.

❖ Application

- ❖ Widely used in biomedical applications like drug delivery and tissue engineering.

Fig 6 shows a **GPC** of poly(tBGE-alt-PA) copolymer obtained by B(C₂H₅)₃/PPNCI-based metal-free catalyst



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