

From Rubber Seed-Derived Fatty Acids to Advanced Polymer Materials: A Challenge of Vitrimer from Linoleic and Oleic Acids

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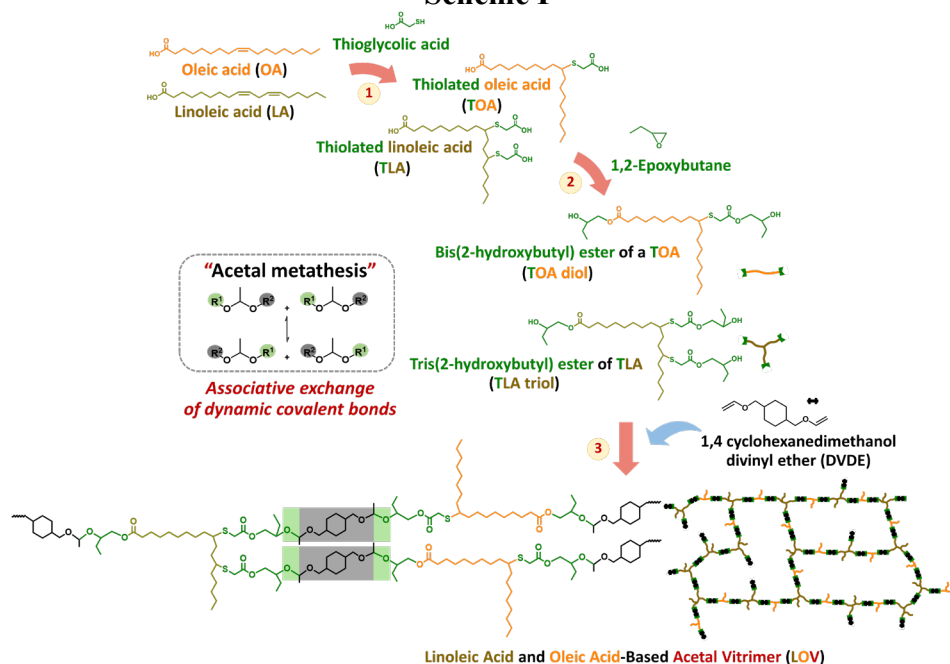
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Abstract

Although rubber seeds are generally treated as agricultural waste, rubber seed oil (RSO) contains abundant saturated and unsaturated fatty acids, including palmitic, stearic, oleic (OA), linoleic (LA), and linolenic acids, making it a promising sustainable feedstock for bio-based materials. Vitrimers are polymeric materials within covalent adaptable networks (CANs) that contain dynamic covalent (DC) bonds.¹ Their thermoplastic-like reprocessability combined with thermoset-like crosslinked structures makes them promising environmentally friendly materials. Among various DC chemistries, catalyst-free acetal metathesis is particularly attractive, as it forms through reactions between hydroxyl and vinyl ether groups and undergoes acetal exchange at elevated temperatures without external catalysts.² From our perspective, combining fatty acid with DC networks offers a practical strategy for developing materials with tailorable structures, desirable mechanical properties, and reprocessability. In this work, OA and LA are utilized to construct vitrimeric materials (Scheme I). OA and LA are first reacted with thioglycolic acid (Step 1), followed by reaction with 1,2-epoxybutane (Step 2) to yield diol and triol monomers. Subsequent reaction with divinyl ether (Step 3) forms acetal-crosslinked OA- and LA-based vitrimers. The presentation will also cover the material performance in relation to the DC networks.

Scheme I



References 1) M. Damien, et al., *Science* 334, 965-968 (2011). 2) L. Yue, et al., *Advanced Materials* 35, 2300954 (2023).

Biography (For Plenary, Keynote, and Invited Speakers)

<p>Name: Suwabun Chirachanchai</p> <p>Title: Professor</p> <p>Affiliation: The Petroleum and Petrochemical College, Chulalongkorn University</p> <p>Country: Thailand</p> <p>Phone 02-2184134</p> <p>E-mail: Suwabun.C@chula.ac.th</p>	
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Personal History:

Suwabun Chirachanchai obtained his Ph.D. from Osaka University in 1995. He soon became a faculty member of The Petroleum and Petrochemical College, Chulalongkorn University. His research focuses are on the modification of polymers and structure-property relationship for development on advanced polymeric materials. He received national recognitions such as High-Potential Research Team Grant Program Award and Distinguished Researcher on Chemical and Pharmaceutical Science Award by National Research Council of Thailand, Distinguish Professorship Award by The Council of University Faculty Senate of Thailand, PTT NSTDA Chair Professor Award by NSTDA and PTT Public Company Limited, etc. He served as the President of Polymer Society of Thailand, and currently is the president of Rubber and Elastomer Technology Association of Thailand.

Research Keyword (3-5 keywords use commas to separate each word):

Functional Polymers, Biopolymers, Nanomaterials, Biodegradable Plastics