

# International Conference and Exhibition on **Biopolymers & Bioplastics**

August 10-12, 2015 San Francisco, USA



## *Richard A Gross*

Rensselaer Polytechnic Institute (RPI), USA

### New-to-the-World bioplastics from yeast derived $\omega$ -hydroxyfatty acid monomers

**Introduction:** Our laboratory is actively exploring routes to biobased polymers and plastics by combining tools of biotechnology and green chemical methods. This paper will describe one research program on  $\omega$ -hydroxyfatty acids ( $\omega$ -HOFAs) and corresponding bioplastics.

**Methods & Results:** Our laboratory has developed an engineered yeast strain that provides the first efficient bio-technological route to convert fatty acids to  $\omega$ -HOFAs. In one example, an engineered *Candida tropicalis* strain used methyl tetradecanoic acid (methyl myristic acid, Me-C14:0) as a feedstock to produce 112 g/L  $\omega$ -hydroxyC14 ( $\omega$ -HOC14) in 55 hours (productivity 2 g/L·h). Polymerization of  $\omega$ -HOC14 to form P( $\omega$ -OHC14) with Mw values up to 140K was accomplished by melt-condensation polymerizations catalyzed by Ti(OiPr)<sub>4</sub>. At or above Mw 78K P( $\omega$ -HOC14) shows a strain-hardening phenomenon and tough properties with elongation at break about 700% and true tensile strength about 50 MPa. Recent work has explored the incorporation of  $\omega$ -HOC14 in thermoplastic polyurethane (TPU) elastomers. At moderate  $\omega$ -HOC14 contents, elastomeric TPU's were obtained that have increased tensile strength and stress at break. Compatibilized blends of PLA with P( $\omega$ -HOC14) were obtained by reactive extrusion. Incorporation of just 5 wt-% of P( $\omega$ -HOC14) increased the elongation at break of PLA from 3% to 150 % while the tensile strength remained almost unchanged.

### Biography

Richard A Gross is currently a full Professor and a Constellation Chaired Professor at Rensselaer Polytechnic Institute (RPI). His research is focused on developing biocatalytic routes to biobased materials including monomers, macromers, prepolymers, polymers, surfactants and other biochemicals. He has over 500 publications in peer reviewed journals, been cited about 15,000 times, edited 6-books and has 26 patents (granted or filed). He was the recipient of the 2003 Presidential Green Chemistry Award in the academic category. In 2010, he was selected as the Turner Alfrey visiting Professor. He founded SyntheZyme LLC in 2009 and serves as Chief Technology officer.

[grossr@rpi.edu](mailto:grossr@rpi.edu)

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