19th World Congress on
Biofuels and Bioenergy

November 13-14, 2025

Webinar

Lignocellulosic biomass conversion: Novel enzyme cascades for high-yield bioethanol

Raymond Carter
University of Queensland, Australia

Lignocellulosic biomass presents a vast and underutilized resource for sustainable bioethanol production, yet its complex structure limits efficient deconstruction. This research introduces an optimized multi-enzyme cascade combining engineered cellulases, lytic polysaccharide monooxygenases (LPMOs), and thermo-tolerant xylanases capable of enhancing cellulose accessibility under industrial conditions. Through structure-guided protein engineering, enzyme stability improved by 55% at elevated temperatures, and synergistic hydrolysis efficiency increased by 68% compared to current commercial enzyme cocktails. Pilot-scale saccharification of sugarcane bagasse achieved 82% fermentable sugar release within 24 hours. Integrated fermentation using engineered yeast strains demonstrated a 30% increase in ethanol yield while reducing inhibitor accumulation. Economic modeling revealed that enzyme loading could be reduced by 23%, significantly lowering bioethanol production costs. Life-cycle assessment showed a 62% reduction in greenhouse gas emissions relative to fossil fuels. These findings highlight the transformative potential of enzyme-driven innovations for large-scale lignocellulosic biofuel production.

Biography

Raymond Carter is a leading expert in industrial biotechnology and bioenergy at the University of Queensland. His research focuses on enzyme engineering, biomass valorization, and fermentation technologies. He has served as principal investigator for multiple international biofuel initiatives and has published extensively in top-tier journals. His innovations in enzyme systems have contributed directly to improving the commercial viability of lignocellulosic bioethanol.

Received: 15 July, 2025; **Accepted**: 19 July, 2025; **Published**: 15 December, 2025