

**Bioproduct Chemistry and Engineering (BCE) Research Unit
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NP307

***Evolutionary enzyme design for improved biorefining of crops and residues
Dominic Wong (dsw@pw.usda.gov)***

***Technologies enabling enhanced product quality, product opportunities, and energy efficiency
in grain biorefining systems
George Robertson (grobertson@pw.usda.gov)***

NP306

***Development of agriculturally-derived biopolymer composites for non-food applications
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In order for biofuels production to be viable in the western states, a wide range of feedstocks will need to be utilized, requiring flexibility in processing capabilities. For example, California is the leading agricultural producer of more than 30 distinctly different crops, ranging from garlic, to artichokes, strawberries, walnuts, and grapes, but has limited supply of corn starch. The BCE Research Unit provides technical expertise in capturing the total value of agricultural resources for biofuels and biobased products in development of (1) new enzymes and technologies for cellulose-to-ethanol capabilities via directed evolution of microbes, (2) novel separation engineering for ethanol and bioproduct isolation, (3) application of bioproducts, biobased plastics and co-product utilization, and (4) biorefinery engineering.

Accomplishments include improved separation technology for reducing energy costs during ethanol production, improved enzyme specificity and yield through microbial screening methods, and optimization of engineering considerations in development of co-mingled biorefineries. One example of particular note is development of a biomass-to-ethanol pilot plant utilizing a mixture of municipal solids waste and ag-derived biomass. Bioproduct successes include commercialization of novel starch-derived single-use items, such packages, utensils, plates and bowls, as well as new uses for ag-derived such as in charcoal and kitty litter.