

Starbucks bio refinery development: Valorization of bakery waste from Starbucks Hong Kong for the production of biodegradable plastics, succinic acid and multi-enzyme solutions

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The School of Energy and Environment at the City University of Hong Kong recently started collaborating with coffee retailer giant 'Starbucks Hong Kong' from March 2012. The partnership, facilitated by the NGO Climate Group Hong Kong, focus on the valorisation of spent coffee grounds and unconsumed bakeries to valuable products via bio-processing. The collaboration is based on a support scheme as part of the "Care for Our Planet" campaign from April 2012 consisting in a donation of HK\$8 (US\$1) for every set of care for our planet cookies charity set sold to support research on valorisation of FW for the sustainable production of chemicals and materials. This project was co-currently funded by the Innovation and Technology Commission from the Government of HKSAR.

Research has been focused on the production of bio-plastics and detergents from unconsumed bakeries via enzymatic hydrolysis of non-pre-treated bakery waste, followed by fungal solid state fermentation to break down carbohydrates into simple sugars for subsequent succinic acid fermentation. A mixture of fungi comprising *Aspergillus awamori* and *Aspergillus oryzae* was utilised for the production of amylolytic and proteolytic enzymes, respectively. Macromolecules including starch and proteins contained in bakery waste were then hydrolysed into a bakery hydrolysate enriched in glucose and free amino nitrogen (FAN). This hydrolysate was subsequently employed as generic feedstock in a bioreaction to produce polyhydroxybutyrate (PHB) or succinic acid by using different micro-organisms.

This work will present different feedstock formulation strategies based on the utilisation of microbial feedstocks produced from bakery waste via the proposed Starbucks biorefinery for the production of biodegradable plastics, platform chemical and multi-enzyme solution.

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