

PRODUCTION OF POLYHYDROXYALKANOATES FROM INDUSTRIAL WASTE STREAMS

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ABSTRACT

Polyhydroxyalkanoates (PHA's) are biodegradable thermoplastics with properties similar to synthetic polymers. PHA's could potentially be used to replace synthetic polymers in throw-away applications and for specialty applications, such as medical implants. The cost of PHA production has limited its integration into widespread use. The areas of high cost in PHA production include medium cost for bacterial growth and recovery cost of PHA from cells. To overcome the cost of recovery a method has been developed with supercritical carbon dioxide and ethanol for a more efficient extraction. To reduce the cost of the growth medium several industrial waste streams have been evaluated as potential feedstocks. Condensed Corn Solubles (CCS), a material that remains after ethanol production (currently used as an animal feed ration), is a nutrient rich medium with a significant portion of glycerol, residual glucose, and some corn oil. Soapstock is a mixture of long-chain fatty acids (LCFA) that is a by-product of the soybean and sunflower processing industries. The research conducted showed that *Pseudomonas putida* KT217 was able to grow in a CCS based medium while utilizing the glycerol as a substrate for growth and PHA substrate. Growth rate and PHA production was dependant on aeration rates and medium concentration. *P. putida* KT217 was also shown to utilize the LCFA present in soapstock for growth and PHA production when added to a CCS based growth following the exponential growth phase. Both of these by-products are available in high quantity for pennies a pound and are good candidates for PHA production.