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PRODUCTION OF POLYHHYDROXYALKANOATES (PHAs) FROM USED FRYING OILS AND POLYMER RECOVERY USING DIFFERENT STRATEGIES

M. Scandola[1]*, L. Martino[1], A. Scoma[2], M. Cruz[3], F. Freitas[3], A.R. Gouveia[3], M.A.M. Reis[3]**

*[1]G.Ciamician' Dept.-University of Bologna, via Selmi 2, 40126, Bologna, Italy; [2]DICAM-University of Bologna, via Terracini 28, 40131, Bologna, Italy; [3]REQUIMTE-Chemistry Department, FCT/Universidade Nova de Lisboa, Portugal, Campus da Caparica, 2829-516; e-mail: *mariastella.scandola@unibo.it; **amr@fct.unl.pt*

Abstract

Polyhydroxyalkanoates (PHAs) are biodegradable polyesters produced by many prokaryotic microorganisms, as intracellular reserve materials. Depending on their composition, PHAs display strongly different mechanical properties ranging from hard to soft materials, thus representing an alternative to synthetically produced polymers.

In the present study PHA is produced by *Cupriavidus necator* DSM 428 using waste frying oil from the catering industry, in fed-batch bioreactors cultivations. A polyhydroxybutyrate homopolymer (PHB) was obtained by using the waste oil as the sole substrate, while the use valeric acid as a co-substrate resulted in the production of a poly(3-hydroxybutyrate-co-3-hydroxyvalerate) (P(HB-co-HV) co-polymer, with 23% HV content.

At the end of the cultivation, the two biomasses, with biopolymer contents of 81.3% (w/w) of PHB and 42.3% (w/w) of P(HB-co-HV), were subjected to different extraction procedures, namely: solvent extraction with chloroform, chemical digestion using either sodium hypochlorite or sulphuric acid, and enzymatic treatment with Alcalase CLEA® or lysozyme. In some cases, heat-shock pretreatments were carried out. The recovered polymer was characterized by thermal analysis and by X-ray diffraction. Finally, the efficiency of the different recovery methods was evaluated.