

Two in one: engineering recombinant biocatalysts for plastic recycling and towards bioplastic production

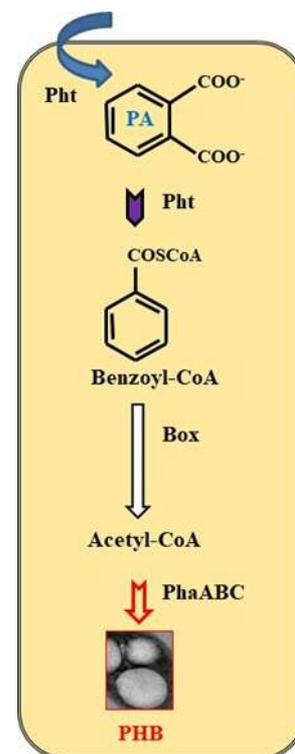
CSIC has developed recombinant genetic cassettes and bacterial host cells comprising them which are useful as biotechnological tools for the aerobic and anaerobic biodegradation of *o*-phthalate (PA) and its bioconversion into value-added biodegradable polymers. The present invention belongs to the fields of microbiology and biotechnology, in particular to support industrially-relevant microbial platforms for bioremediation of environments contaminated with phthalates, for plastic recycling and for bioplastic biosynthesis.

An offer for Patent Licensing

New biotechnological system to valorize PA from plastic waste in an effective, ecological and economic way.

The PA esters are produced massively since they are essential constituents of plastics acting as plasticizers. Since phthalate esters are not covalently bound to the plastic, they can easily diffuse out of the polymer itself, leading to contamination in nearly every environment. Thus, phthalate esters are one of the most frequently detected persistent organic contaminants in the environment, and they have been listed as major man-made priority pollutants due to their hepatotoxic, teratogenic, carcinogenic and endocrine disrupting (anti-androgenic) properties. Within the current strategies for plastic recycling as a sustainable plastic waste management, the treatment and valorization of the PA esters constitutes a major challenge. Microbial degradation of the aromatic moiety (PA) of such esters becomes an efficient, cost-effective and environmentally friendly strategy.

We provide a recombinant genetic cassette which comprises the catabolic genes involved in the *pht* pathway as well as a specific secondary transporter that are essential for microbial PA degradation. The invention also relates to recombinant host cells comprising this cassette and useful for the aerobic and/or anaerobic biodegradation of PA and for its bioconversion towards the biosynthesis of value added biodegradable polymers such as polyhydroxybutyrate (PHB).



Funneling PA towards the synthesis of polyhydroxybutyrate (PHB) in biocatalysts expressing the *pht* cassette.

Main innovations and advantages

- The catabolic and transport *pht* genes responsible for PA bacterial degradation via benzoyl-CoA have been engineered as a mobilizable DNA module.
- The *pht* cassette allows both aerobic and anaerobic PA catabolism in different bacterial hosts.
- A novel metabolic strategy to valorize PA towards the biosynthesis of a biodegradable plastic, i.e., polyhydroxybutyrate (PHB), has been developed using the industrially-relevant bacterium *Cupriavidus necator* HI6 strain.

Patent Status

European patent application filed

For further information, please contact

Marta García Del Barrio, Ph.D.

Centro de Investigaciones Biológicas Margarita Salas.

Deputy Vice-Presidency for Knowledge Transfer of CSIC

Tel.: 34 – 91 1098055

E-mail: transferencia@cib.csic.es
comercializacion@csic.es