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Sommario/riassunto

Nowadays, we are witnessing highly dynamic research activities related to the intriguing field of biodegradable materials with plastic-like properties. These activities are currently intensified by a strengthened public awareness of prevailing ecological issues connected to growing piles of plastic waste, microplastic formation, and increasing greenhouse gas emissions; this goes hand-in-hand with the ongoing depletion of fossil feedstocks, which are traditionally used to produce full carbon backbone polymers. To a steadily increasing extend, polyhydroxyalkanoate (PHA) biopolyesters, a family of plastic-like materials with versatile material properties, are considered a future-oriented solution for diminishing these concerns. PHA production is based on renewable resources, and occurs in a bio-mediated fashion by the action of living organisms. If accomplished in an optimized way, PHA production and the entire PHA lifecycle are embedded into nature´s closed cycles of carbon. Holistic improvement of PHA production, applicable on an industrially relevant scale, calls for inter alia: consolidated knowledge about the enzymatic and genetic particularities of PHA accumulating organisms, in-depth understanding of the kinetics of the bioprocess, the selection of appropriate inexpensive fermentation feedstocks, tailoring the composition of PHA on the level of the monomeric constituents, optimized biotechnological engineering, and novel strategies for PHA recovery from biomass characterized by minor energy and chemical requirement.