A Practice-Driven Biodegradation Innovation Cluster for Biopolyesters and Renewable Materials

The transition to renewable materials requires more than replacing fossil carbon with biobased feedstocks. For applications with potential leakage to soil or water, validated biodegradation performance is essential. Microplastics formation, environmental persistence, and the gap between laboratory testing and real-world conditions remain critical barriers to responsible implementation.

For the Renewable Materials Conference, this topic is highly relevant: the credibility and scalability of renewable polymers depend not only on renewable origin, but on demonstrable and predictable end-of-life behavior. Biobased materials must perform functionally during use and degrade safely after their service life.

BioBased Circular (BBC) is a nationally funded Dutch subsidy fund focused on accelerating industrial development and market uptake of **biopolyesters**. The program strengthens value chains by supporting collaboration between industry, research institutes, and public stakeholders, with emphasis on practical implementation, industry scaling and removal of technical barriers. To date (feb 2025, BBC funded approximately 100 innovation projects, 6 fundamental studies, mostly aiming for products where biodegradation is a key requirement).

Biodegradation is a strategic theme within BBC. For example, in the Netherlands alone, approximately **20 million m² of geotextiles**are applied annually and around **20,000 km of drainage pipes** are installed in soil each year. These large material volumes illustrate the scale at which renewable and potentially biodegradable alternatives could reduce persistent plastic accumulation in soil systems, provided their degradation behavior is scientifically validated and environmentally safe.

BBC is actively involved in biodegradation-in-practice projects, including development of **microplastics-free procurement criteria** and accounting for microplastics in sustainability evaluations. In application-focused projects, they demonstrate the opportunity for impact at scale, but also highlight uncertainties regarding fragmentation, degradation rates, residual fractions, and ecological effects.

To address these challenges structurally, BBC is establishing a **Biodegradation In-practice Innovation Cluster**. Industry feedback indicates strong demand for improved interpretation of biodegradation data, accessible test infrastructure, and clearer regulatory alignment. A key issue is translating standardized laboratory biodegradation tests into predictable performance in soil and other real environments.

The cluster integrates sectoral case studies, applied research, infrastructure investment, and structured policy dialogue within one coordinated framework. Real-world applications serve as testbeds to determine where biodegradability adds measurable value and under which boundary conditions. Targeted R&D addresses differentiation between biodegradation and fragmentation, degradation kinetics, ecotoxicity of intermediates, mass balance closure, and predictive modeling. Investments in shared biodegradation testing and advanced analytical facilities strengthen national capacity and ensure transparent access for industry and research partners.

By linking industrial biopolyester development with validated end-of-life performance at significant material volumes, the Biodegradation Innovation Cluster supports responsible scaling of renewable materials. This directly contributes to the conference objective of advancing renewable material systems that are not only biobased, but demonstrably safe, functional, and environmentally sound across their full lifecycle.

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