Home compostable 3D printing filament

Within its work on the European Nenu2phar project, Elixance (Elven, France), a company specialized in the elaboration and production of masterbatches and compounds, has developed a compostable 3D printing filament based on PHA. The R&D department formulated two types of filaments to cover a large field of applications: a rigid filament, and a more flexible one. The objective was to develop a fully biodegradable filament without losing the performance of a petroleum-based plastic like, e.g. TPE, ABS.

The company already has a large range of green products under its brand Elixbio and acquired a strong knowledge in the use of naturals fillers blend with biopolymers. By applying this knowledge to the 3D printing area with its partner Nanovia (Louargat, France), they made printable formulations based on biodegradable raw materials. These formulations include PHA, a compostable polymer that comes from renewable resources, and natural fillers, such as hemp or oyster powder.

In the exploration of their mechanical performance, the formulations were extruded and printed into test bars for mechanical characterization. These properties were compared to properties of non-compostable 3D filaments. The formulations with the most interesting performances were then used to print different complex geometry parts.

The rigid filament is a blend of PHB, PHBV, and incorporated hemp fibres and achieves mechanical properties close to a filament made of PLA: high tensile modulus and good impact resistance. The flexible filament is a blend of PHB and PBAT with oyster powder, with a low tensile modulus and a high elongation at break (around 300 % according to ISO 527-1). These properties are similar to those of TPE.

For several years, Elixance has been developing bioplastics with a circular economy philosophy, using natural fillers and fibres (oyster and scallop shells, flax, hemp, etc.) from local resources. By working with natural fillers, they find a way to convert by-products into valuable materials and to naturally colourize the filaments, even though these compostable filaments could be colourized with vegetable or mineral pigments.

These new home-compostable filaments open up the field of external applications for 3D printer owners with a sustainable management of the end-of-life.

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