RECOMMENDATIONS

Recommendations to polymer industry

Another origin of the quite high impact of PBS production is linked to the low scale of polymer synthesis.

- **Enlarge the uses of PBS** should help the development of high scale production lines. PBS should find a good development in:
  - Agricultural mulch films which represent a large part of plastic film market; in this application, the main default of PBS which is its fast degradability, is a great advantage.
  - Commodity products. For these applications hydrolysis stabilizers can be used (long plastic shelf life is realistic) and PBS can easily substitute PP and HDPE
- **Diversify the factory productions**: today the model of polymer factories is characterized by very specialized high scale lines dedicated to the production of a specific polymer. An alternative model should be to invest in flexible lines adapted to the production of aliphatic polycondensates.
- **Consider the option of a two-step production, by melt condensation followed by SSP:** this route could support also the ability to multiply the types of grades (branching, block copolymers). This route makes consistent the idea of using large scale production and the need to develop a wide variety of grades

One of the issues for the flexible use of PBS by transformers and end users is its sensitivity to hydrolysis. As shown in the project, the degradation rate depends on the acidic index, the water content, and temperature. At the level of polymer synthesis the **good control of end chains** is essential to manage a low acidic index. Another obvious point is the residual water content in the material; generally decreased at very low concentration during the synthesis, the water content can be unfortunately increased again during post operations such as pelletizing or inappropriate storage. A dedicated **quality approach should be applied to maintain the water content under appropriate limits**, depending on material shelf life

The benchmarking of PBS revealed a limited number of references compared to other materials. More critical is the absence of some essential grades, dedicated to important applications:

- Development of **branched** and /or high IP grades, dedicated to film blowing applications.
- Development of soft copolymers with a limited decrease of Tf (**low comonomer content**)
- Development of low melting copolymers for sealing applications **(high comonomer content)**

As a last recommendation, efforts must be put on the reduction of PBS overall migration: (i) by reducing the oligomer content (thanks to synthesis conditions or thanks to post treatment after polycondensation) (ii) and as migration is also linked to the degradation state, by applying the recommendations linked to the limitation of the sensitivity to hydrolysis.

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