MIGRATION FROM RECYCLED POLYMER BOTTLES.

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Abstract. In recent years, plastic packaging has grown considerably. These plastic materials have the advantage of being inexpensive (raw material), shock-resistant, and easy to implement (implementation temperatures below 300°C). They are recyclable or incinerable, which will prevent them from piling up in public landfills after the development of recycling channels. Poly(ethylene terephthalate) or PET has gradually replaced PVC for the packaging of mineral water and sodas, a major source of hydrochloric acid during its incineration (more than 550 kg per ton of PVC, it is blamed for acid rain and significant corrosion of incinerators). Production of PET packaging thus doubled worldwide from 1996 to 2001, increasing from 3,289,000 to 7,123,000 tonnes per year (estimate for 2001).

Keywords: polymer, temperature, polyethylene, polyvinylchloride, processing, mass ratio

Introduction. However, current PET recycling channels (textile fibre, for example – polar wool) are not always sufficient to recycle these packages in sufficient quantities, with production also taking off significantly. However, European legislation provides for 2001 to oblige EEC member countries to recycle 25 to 45% of their waste, including a minimum of 15% per material. To increase the recycling rate of polymer packaging, it is necessary to open up new outlets as packaging for food contact[1]. However, the regulations concerning food packaging are very strict and only authorise contact with virgin packaging, the constituents of which (monomers and additives) have been studied from a toxicological point of view. However, polymers have the ability to sorb chemical species. So, between consumption and collection of the packaging, contamination by undesirable substances (unknown type and quantities) is possible (petrol,

pesticide, oil, paint, solvent, household products, etc.). After recycling, these pollutants are likely to migrate to the food and represent a danger for the consumer[2]. Monomers are used in polymer synthesis. Traces of monomers and oligomers may remain at the end of the synthesis, and be retained in the matrix where they are generally very soluble.

Catalysts or initiators are also used to increase polymerization yields and kinetics. These substances (or their derivatives) based on metals and/or organic substances are likely to be present in the packaging.

In addition, during polycondensation, small molecules can be obtained as reaction by-products. This second product is of course toxic, and therefore must be eliminated by various industrial processes[3]. Recycling would also reduce our dependence on imports of fossil fuels and raw materials. On the other hand, the contribution of recycling to the fight against waste and plastic pollution is more mixed: with regard to waste production, the proportion of open-loop recycling and the physical limit to the number of recycling cycles make it a temporal buffer for waste formation, without preventing. As for plastic pollution, it is not limited to the end of life of plastics, but concerns all stages of their life chain (production, use, end of life). The legislation has set recycling and incorporation targets for recycled raw materials (RPM) at both European and national levels to encourage the plastics economy to be more .

At the same time, measures have been taken to strengthen collection, sorting57 and recycling, through the extension of the sorting deposit, the introduction of an incentive fee and the obligation to sort biowaste at source[4]. These provisions involve significant financial efforts for local authorities61 which, in some cases with the support of the State and eco-organizations, have invested massively in collection (bins, trucks) and sorting (sorting centers, recycling centers) infrastructure. The number of extended producer responsibility (EPR) sectors has increased significantly in order to ensure the prevention and

management of waste. The recyclability of plastic waste is the subject of numerous research projects both at the national (in particular through the PEPR recyclability, recycling and reincorporation of recycled materials) and European levels and the progress made to promote high-quality, even closed-loop, mechanical recycling must be highlighted. On the other hand, eco-design remains insufficiently developed despite the incentive and prescriptive mechanisms set up by eco-organizations and public authorities. Chemical recycling includes a variety of techniques, still little used at the industrial level and which raise many questions, whether regarding their environmental impact, the elimination of toxic chemical substances, their contribution to the circular economy and the traceability of products resulting from these technologies[5].

Conclusion

For transparency reasons, the conversion factor must take into account the various elements that can reduce the quantity of materials to which credits can be allocated (losses in waste, conversion of inputs into energy) and only outputs intended for material applications must be taken into account. Furthermore, calculating the mass balance using the credit method, widely defended by manufacturers, can lead to a strong disconnect between the physical reality of the recycled material content and the claim for a certain recycled material rate. This method cannot therefore be used to quantify recycled content.

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