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Editorial

Lifetime Prediction of Polymeric Materials

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Abstract: The wide category of organic materials containing polymers had a great impact on the last middle century, and continues to nowadays, thus affecting our daily behaviors. The need to investigate their durability has grown, which may be necessary in the successful completion of the application for which these materials were designed, and to mitigate their impact on the environment. The aim of this Special Issue was to allow researchers, in both Industry and Academia, to show their current research in material properties finalized to the lifetime prediction.

Keywords: lifetime prediction; thermal stability; thermal behavior; materials degradation; thermogravimetric analysis; induction period; end of life; kinetics of degradation; decomposition

Over the last thirty years, environmental problems related to the disposal of polymers (plastics, in the term most commonly used in the media) that have completed their lifecycle have begun to arise [1–4], and the need to foresee their end of life has become increasingly urgent [5–7]. The aspects related to the disposal of plastic materials are gaining more and more importance, since the industry, and arguably the research on materials in general, is historically driven by the need to extend and implement the main materials' function of protection and preservation, all aspects contributing to a long life and persistence in the environment after their use. Thus, the study of the materials' thermal properties finalized to the lifetime prediction is a key point to improve recyclability or provide a viable alternative.

A sensible increase in research with the lifetime prediction of polymeric materials as their topic was recorded in recent years, reaching an annual average of eight hundred manuscripts, with an increase of 1500 percent [7]. The cause of this constantly growing trend is to be found both in the need to investigate the durability of polymeric materials for structural applications, which can be incredibly important in the successful completion of the application for which the material was designed, and in the environmental concerns related to the disposal of polymers after their shelf life. This latter reason, namely the plastics disposal, acquired great importance and it has even become a more dominant motivation over the former one.

In the last decades, terms such as microplastics, plastic-free, Great Pacific Garbage Patch and hashtags such as "#fridayforfuture" have become very popular [8–10], thus bringing to the forefront the problems related to the disposal of plastic waste, especially those deriving from food packaging. The public pressure regarding the problems derived from the environmental issues increasingly pushes the polymer-packaging industry, industry in general, and academic research to design and develop polymeric materials easily disposed of or recycled after use. Consequently, all possible information about polymer's end of life has become increasingly urgent. In this Special Issue, we will host scientific publications concerning the lifetime predictions of polymeric materials, trying to answer the most frequent curiosities of those researchers who approach these studies by using thermal analysis techniques.

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