

Determination of Antioxidants and Erucamide Slip Additives in Polyethylene

- Accurate analysis
- Sufficient selectivity within a reasonable time
- A validated and sensitive HPLC method with high repeatability
- ASTM D5524-94 & ASTM D6953-18

Polyolefin is widely used in the fields of household appliances, packaging and building materials because of its rich source of raw materials, low production cost and good comprehensive performance. It has become an indispensable material in human life and production and occupies an important position in the national economy. Polyethylene (PE) is a kind of polyolefin which has been widely used in many fields. However, polyolefin in the preparation, storage and application is inevitably affected by factors such as heat, light, oxygen, heavy metal ions and mechanical shear, resulting in discoloration and mechanical physical properties degradation. Its products turn yellow, hard and brittle, and even completely lose their use value. In order to inhibit its oxidative degradation, antioxidants are generally added to polyolefins.

On the other hand, degradation of additives is widely recognized as a source of discoloration in polymers. Such degradation has a detrimental effect on the optical qualities of a polymer and may seriously limit its commercial application. A number of factors such as heat, oxygen, catalyst residues, gamma radiation and additive–additive antagonism can contribute either directly or indirectly to the formation of colored compounds. For example, fatty acid amides which are used as ‘slip’ additives to reduce the coefficient of friction at the surface of low-density polyethylene (LDPE) films, may cause discoloration via the absorption of atmospheric phenolics. Thermal degradation which occurs during film processing is known to have an adverse effect on the properties of slip agents and can cause various slip additives with particularly poor thermal stability to become ineffective at reducing the coefficient of friction of the film. Of the fatty acid amides added to LDPE for this purpose, Erucamide is the one most widely used. Erucamide is generally considered to impart moderate ‘antiblocking’ properties to films and, as such, it reduces the phenomenon of ‘blocking’ which is the tendency of adjacent layers of film to adhere together causing an impediment to easy separation. It has also been suggested, that Erucamide may cause blocking in some LDPE films.

So, controlling the amount of antioxidants is conducive to improve the quality of polyolefin products, reducing costs and improving economic benefits. Therefore, it is necessary to use a simple, rapid and accurate analytical method for determining the content of trace antioxidants in PE 1.

Polymer Additive Analyser is a dedicated system based on high-performance liquid chromatography (HPLC) with ultraviolet/visible (UV/VIS) detection to analyze additives such as antioxidants and Erucamide Slip in polymer formulations.

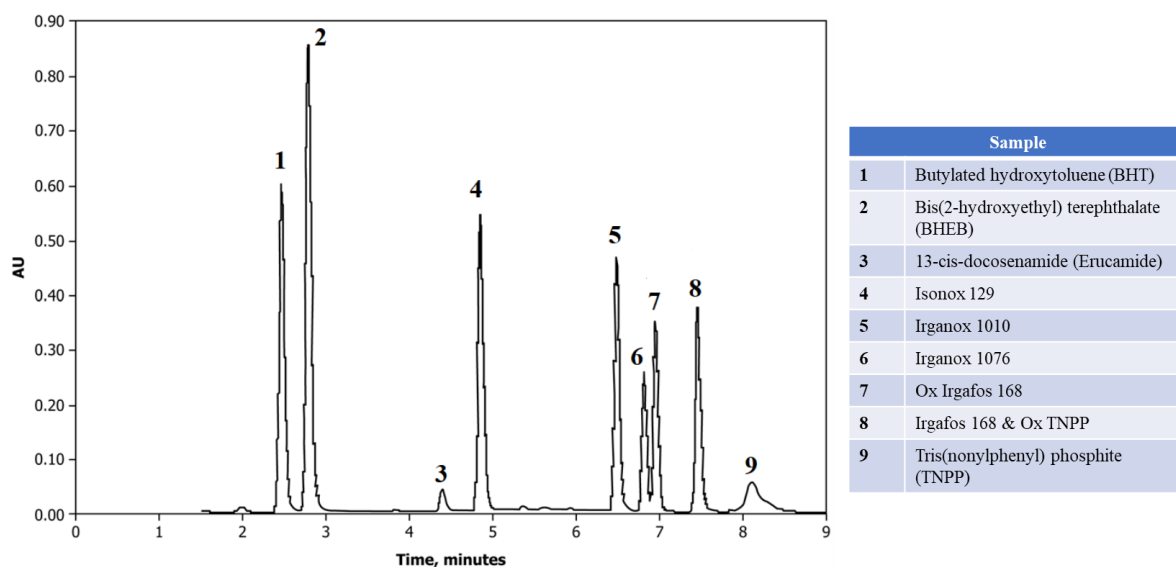


Fig.1 Chromatogram of Multicomponent Antioxidant Standard Recorded at 200 nm (ASTM D6953)

¹ A) Polymer Degradation and Stability 62, 1998, 285-290, B) MATEC Web of Conferences 358, 2022, 01029