ATMOSPHERIC SOLID ANALYSIS PROBE
ION MOBILITY MASS SPECTROMETRY OF POLYPROPYLENE

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Polyolefins, in particular Polypropylene (PP), constitute a very important class of polymer. Indeed, they have excellent material properties and interesting cost/performance ratio leading to a wide range of applications. In the recent years, the growing interest in recycling plastic wastes, as well as the understanding of their degradation mechanisms, increases the necessity of fast characterization of PP. The lack of organic function in this aliphatic polymer prevents cation attachment, making particularly difficult their analysis by mass spectrometry (MS). So, a classical way to study polyolefins by MS generally involves a pyrolysis step[1].

Recently, Atmospheric Solid Analysis Probe (ASAP) was developed as atmospheric ionization source for rapid analysis without sample preparation step[2]. This probe was applied to the identification of stabilizers in different polymer samples[3]. In the present study the combination of the ASAP probe with Ion Mobility Mass Spectrometry (IM-MS) was explored for PP characterization. The extra dimension given by Ion Mobility, based on the drift of ions in a buffer gas under the influence of an electric field, is highly complementary with MS data. While this combination (IM-MS) was widely used for biomolecules, it was also successfully applied to synthetic polymers[4].

Here we demonstrate the interest of IM-MS(/MS) in combination with the ASAP probe for fast and simultaneously characterization of both stabilizers and polymer. The intrinsic principle of ASAP allows in-source pyrolysis of PP, giving volatile and ionizable compounds, to be done. These residues were then analyzed and separated from volatile stabilizer ions in the mobility cell. Accurate mass measurements combined with IM-MS(/MS) experiments were carried on different samples, allowing a rapid identification of stabilizers. Moreover, different pyrolysis products were observed for sample with or without stabilizers, allowing the influence of stabilizers to be studied.

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