THE EVIDENTIAL VALUE OF POLYMERS IN FORENSIC SCIENCE

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ABSTRACT

Traces are the remnants of an activity and contain the most basic 'material or physical' information on the dynamics of what happened at a certain location. As such, traces found on a crime scene are useful tools for supporting investigators in identifying the felon.

Given the extremely large number of polymeric objects that daily surround us, it is very surprising that very few established forensic protocols exist, that are specifically aimed at exploiting the evidential value of polymeric traces. One of the major reasons that delayed the exploitation of polymeric items in forensic science is their perceived 'commonness', and as a consequence of this judges and lawyers tend to associate to these traces a low evidential value. The prerequisite for a successful strategy in forensic polymer characterization should therefore be the ability to assess the influence that slightly different production processes have on the structure of the transformed polymer.

A further surprising issue is that even when forensic protocols aimed at polymeric traces exist, they are rarely focused on the characterization of typical features that differentiate polymers from small-molecular-weight molecules. Semi-crystallinity, average molecular weight and molecular weight distribution are in fact usually ignored as parameters in such protocols, thereby limiting the informative value that can be acquired in the forensic lab.

Particular stress should be given to the need of flexibility in the analytical protocol as a function of the case. Forensic analyses can in fact be applied in two different contexts: justice driven forensic science and intelligence driven forensic science.

The justice driven approach consists in the use of forensic case data to assist the administration of evidence in the perspective of the court trial. It involves all the analyses which are carried out to verify a particular reconstruction of the criminal event. In other words, the forensic examinations in the justice driven approach are used to corroborate the thesis either of the prosecutor or of the defendant.

Intelligence driven forensic science consists in the development of models by which forensic case data can be used to contribute to decision making in the context of traditional investigation, with the aim of increasing the efficiency of the process of identification of the felon and allowing to better interfere with the criminal action. Forensic intelligence is much more challenging than justice driven forensic science, because it involves correlating heterogeneous data coming from different sources, expressed in different ways, and with various meaningfulness.

Examples dealing with the forensic characterization of plastic reflectors of vehicles, of polyurethane foam and of plastic films will be presented in this communication, discussing how the challenge to develop protocols for forensic intelligence has been dealt with.