R&D OF NOVEL HIGH-INTENSITY ELECTRIC FIELDS APPLICATIONS

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Over the last 50 years, the branch of high-voltage (HV) engineering called "electrostatic processes" has provided the foundation for extraordinary, new industrial developments measured in billions of U.S. dollars. All these processes make use of the electric charges and forces that may be generated in a high-intensity electric field. The range of applications extends from electrostatic painting to the separation of granular mixtures in the recycling industry, and from air filtration to waste water treatment [1, 2]. Electrostatic techniques serve also to remove unwanted electric charge and prevent the related hazards [3].

This presentation is aimed to introducing to the electrical engineers and scientists attending this conference some of the electrostatic processes developed by our research team at the PPRIME Institute, on the campus of the University Institute of Technology in Angoulême. With more than 600 scientists, doctoral students, engineers and technical staff, PPRIME Institute is the largest research unit of the French National Center for Scientific Research in the field of physical sciences for engineers. The PPRIME's research team directly involved in the present study has a world-wide-recognized expertise in electrostatic processes, as demonstrated by hundreds of scientific publications, more than 40 PhD theses, tens of industrial partnerships and two patents active in most of the countries in the world.

The use of high-intensity electric fields for sorting the constituents of granular mixtures is the class of electrostatic processes on which most of our investigations have been focused. In our talk, we will introduce the principle of operation of these devices and give some hints on the HV experimental techniques that we are currently using. After a brief presentation of the main applications of the electrostatic separation in the recycling industry, we will expose in more detail the techniques that are specific to the treatment of waste electric and electronic equipment (Fig. 1).

Fig. 1. Tribo-aero-electrostatic separator for mixed granular plastic wastes (Patent **WO2010109096 -2010**)

To illustrate the diversity of high-intensity electric fields applications, we will also describe the use of: (1) dielectric barrier discharges for the modification of the tribological characteristics of polymers; (2) AC corona discharges for the elimination of static electricity; (3) DC corona discharges for the precipitation of dust in industrial effluents and for improving the performances of electret filters.

In the end, we will discuss the perspectives of expending the range of industrial applications of the HV engineering techniques designated as "electrostatic processes".

References

[1] J.S Chang, A.J. Kelly and J.M. Crowley (Eds), Handbook of Electrostatic Processes. New York: Dekker, 1995.

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[3] K. Adamiak, and L. Dascalescu, "Applied Electrostatics: Second Youth of Grandma Electrostatics," *IEEE Ind. Appl. Magazine*, vol. 16, pp. 2-13, 2010.