Dispersion and vaporization of a spray of electrically charged droplets in a coflowing hot gas[1] ANGEL PERENA, FRANCISCO HIGUERA, Universidad Politecnica de Madrid — A numerical model of a dilute spray of electrically charged liquid droplets vaporizing in a hot gas is formulated based on a Eulerian description of the gas and Lagrangian tracking of the droplets. The model is used to simulate the dispersion and vaporization of a spray in a cylindrical chamber where the droplets are axially injected with a coflow of hot gas. The effects of the initial size of the droplets and of the gas-to liquid mass flux and inlet temperature ratios are analyzed, and the conditions under which the droplets fully vaporize in the chamber without impacting on its walls are determined. The ranges of operation where these requirements are met widen when the flow rate of liquid is split into a number of sources and injected through different orifices, which also improves the uniformity of the temperature and vapor mass fraction distributions at the outlet of the chamber. The effects of satellite droplets and of a high voltage applied between the bases of the chamber are considered.

Francisco Higuera
Universidad Politecnica de Madrid

Date submitted: 28 Jul 2015   Electronic form version 1.4