

294a Mathematical Analysis of the Power Law Model for Non-Newtonian Fluids in an Electrophoretic Cell with Joule Heating

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In search of new chemical products, to explore the potential benefits of their physicochemical properties, non-Newtonian fluids have captured the attention of developers. The implications in terms of understanding the most basic unit operation and transport phenomena are not simple. Although the hydrodynamic developed by non-Newtonian fluids and induced by pressure driven forces has been studied in the past, the influence of other forces has not been fully engaged. One avenue commonly used to assess the divergent Newtonian behavior has been the Ostwald-de Waele Model "Power Law Model" directly related to the velocity field of the fluid.

This contribution focuses on the study of the hydrodynamics triggered by free convective forces on different non-Newtonian fluids. Furthermore, the study concentrates on the application of the Taylor's expansion series as a strategic solution of the "Power Law hydrodynamic model". Several cases of Joule heating generation are examined and its influence on the velocity profile. The realistic implications of considering batch conditions are also discussed.