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Compositional and Structural characterization of complex fluids via Electrical Impedance Spectroscopy and Electron Microscopy

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The water-based inks with polymeric latex particles used in printing technology deliver prints of superior quality at a low cost and environmental friendly. Via ink formulation and drying processes, the inkjet prints are characterized by a wide color gamut, intense gloss with tonal graduations and excellent mechanical properties.

Various methods and techniques are used to investigate the constituents of water based inks bridging the ink formulation to the print final product. In this work we propose the use of Electrical Impedance Spectroscopy (EIS) method with a cylindrical measurement cell in combination with Electron Microscopy (HR-SEM). The EIS is used to characterize, from simple towards complex mixtures, fluids from resembling the water-based ink. Particles like pigment and polymeric latex are components of such complex fluids. In this work we use EIS to study material properties (e.g. dielectric constants, and electrical resistivity) of complex mixtures and, based on a calibration procedure, to identify the composition of the mixture. From here, physical processes such as water evaporation of aqueous mixtures, have been investigated in their dynamics.

The hardening of the complex mixtures with particles allowed us, via HR-SEM, to investigate the structural properties of the resulted ink layer as a function of the initial composition.

Theoretical models and computational simulations were used to analyze the EIS experimental data and to improve our understanding.
We consider the EIS in combination with microscopy a valuable tool in these studies; of course there are limitations of the method, which together with its advantages, are the discussed in this work.

Participation

In-Person

References

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