STABILITY IN INKJET PRINTING INKS

Adriana Belda, Yolanda Bautista, Noelia Coll, Vicente Sanz

Instituto de Tecnología Cerámica (ITC). Universitat Jaume I,
Castellón, Spain

1. INTRODUCTION

When a solid particle enters a liquid, it is subjected to a set of forces that favour or act against sedimentation. Thus, particle sedimentation is favoured by particle weight, whereas the flotation forces (Archimedes upthrust) and friction act against sedimentation.

The suspension also needs to stabilise from a **colloidal** point of view. That is, the appropriate repulsion forces need to be generated to keep the particles separate. The repulsion forces may be electrostatic and/or steric. These forces are controlled by molecules that are adsorbed on the particle surface and/or regulate the electric charges in their proximity. As in the previous case, particle aggregation increases hydrodynamic size, which usually raises particle sedimentation velocity.

The recent introduction of inkjet technology into the ceramic sector has led companies to adapt to the new needs. The inks used have progressively evolved parallel to the technology; however, certain problems persist, such as ink instability with time, owing to agglomeration and sedimentation phenomena.

This study has sought to establish a methodology that not only enables ink quality to be controlled, but also identifies the causes of ink instability when this is observed.

2. INSTRUMENTAL TECHNIQUES

The flow curves and viscosity of different suspensions have been determined as a function of the applied shear rate, using a rheometer with high sensitivity.

The zeta potential of the suspended particles was determined by electro-acoustic techniques that allow this to be determined in concentrated suspensions.

Colloidal stability was determined using techniques based on multiple light scattering.

3. RESULTS

The methodology proposed enables different properties of the material to be identified and related to the type of stability and sedimentation characteristics.

The aggregation state of ceramic ink suspensions for inkjet printing was evaluated by rheological characterisation. The sensitivity of the apparatus allowed aggregate formation, which can increase sedimentation velocity, to be detected.

The effectiveness of electrostatic stabilisation was ascertained by determining the zeta potential of the particles in the ceramic inks. Although the suspending media of the inks exhibited low polarity, the electrostatic charges were observed to contribute to the stabilisation of the system.

In studying the stability of ceramic ink suspensions, the progress of the sedimentation front was evaluated in order to determine the sedimentation velocity and the variation of the degree of light backscattering in the centre part of the container where sedimentation took place. This last characteristic is related to the ability of the particles to approach each other during the sedimentation process.

4. CONCLUSIONS

In this study, a methodology has been developed that enables the agglomeration and sedimentation phenomena of particles in ceramic inks to be identified. The methodology can be used to improve the stability of ceramic ink suspensions for inkjet printing.