PAPERS COATED WITH A MODIFIED PIGMENT OBTAINED BY \textit{IN SITU} SYNTHESIS OF SILICA FILM ON PCC

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ABSTRACT

Different silica grades and precipitated calcium carbonate (PCC) particles are commonly used as pigments for the coating of printing and writing papers aiming to improve the inkjet printability. These pigments present high reflectance in all the visible wavelength range, superior brightness and refractive index, and also good compatibility with the other components commonly used for the coating process (such as binders, co-binders, dispersants, etc.), which are important characteristics to consider in order to immobilize them at the paper surface and to obtain better printing quality properties. In particular, for the silica, its high porosity may help on a better retention of the dyes molecules at the paper surface.

Papers coated with porous silica particles are considered to have better performance regarding inkjet printing quality. On the other hand, PCC, a much cheaper material, is not so effective in the printing process. In this context, a new material which combines the best of the properties of silica and PCC could be of great interest. Therefore, the purpose of this project is a) to effectively change the surface of PCC particles with small amounts of silica, and b) to use the modified PCC’s for paper coating in order to improve printability and paper optical properties.

Silica was produced \textit{in situ} at the surface of PCC by sol-gel method \textit{via} hydrolysis of tetraethyl orthosilicate (silica precursor) in ethanol/water solutions. The presence of silica in the modified PCC particles was clearly detected by infrared absorption spectroscopy, \textit{i.e.}, by the bands due to the stretching and bending vibrations of the Si-O bonds. On the other hand, by scanning electron microscopy it was possible to identify the deposition of a nanometric film of silica sol at the surface of the PCC particles. The amount of silica retained on the surface of the modified PCC particles was determined by thermogravimetry. Their value was found to vary between 5\% and 30\%, depending on the experimental conditions used, namely the ammonium concentration of the reaction medium. By granulometric analysis it was possible to say that the medium sizes of the particles have not been considerably changed by the incorporation of silica at the PCC surface.

The new PCC’s modified with silica were used in distinct formulations with selected binders, co-binders and dispersants, and these were then applied at the paper surface. The results of inkjet printing quality for the new coated papers are presented and compared with those of commercial papers.

Keywords: coating, inkjet printing, silica, sol-gel, PCC.