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PIGMENTED AQUEOUS SYSTEMS FOR DIGITAL DECORATION

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Ceramic pigments are important materials for digital decoration of ceramic tiles and are preferred as colouring agents in solvent based inks. On the other hand, due to environmental problems associated with these inks, water based systems are envisaged as a green alternative for ceramic tile decoration. Controlling the rheology of water-based systems is an important factor to achieve a better product performance; however, there is little knowledge about the effect of particle size and pigment type on the stability of submicrometric aqueous pigmented suspensions. This study is aimed at defining the rheological behavior and stability of three different pigments in water: i.e., $ZrSiO_4:V$, $(Ti,Cr,Sb)O_2$ and $(Co,Mn)(Fe,Cr)_2O_4$. The pigments were ground to submicron level using circulation type agitator mill (Netzsch Labstar LS1) by varying parameters (rotation speed, type and amount of dispersants and bead size). Rheological and electrochemical properties were also monitored. Polycarboxylic acid-sodium salt and ammonium polymethacrylate were chosen as two different dispersants for the determination of effective stabilization mechanism. Stability of aqueous suspensions of the pigments was studied by sedimentation tests, and dynamic light scattering method for the determination of zeta potential and isoelectric point (zeta potential in function of pH). The rheological properties were measured with a rotational rheometer. The interval of pH where zeta potential is out of the typical stability range (-30; 30 mV) and, correspondingly, the most stable conditions, according to the pH values, were determined. These results were confirmed by sedimentation and viscometric experiments: by increasing pH with respect the isoelectric point, both zeta potential and sedimentation rate decrease. Effect of particle size distribution and particle shape of each pigment on rheological properties were also evaluated and found out that a wide particle size distribution decreases viscosity, while the elongation of particles due to plastic deformation increases the viscosity.