Contribution à la caractérisation et synthèse de pigment de peinture à base de calamine. Evaluation de la qualité et analyse des incertitudes sur les propriétés.

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Abstract: The iron oxide pigment consists of 53.18% iron with a siliceous matrix. The calamine itself contains 73.83% iron. The density of the pigment and calamine is respectively ?=3.0665 g/cm3 and ?=5.4203 g/cm3. The pigment is of oolitic structure. Calamine has a homogeneous structure of the three iron oxides. The grain size of the compounds is between 0.6 and 40 ?m with a D50 of less than 8 ?m. Their specific surfaces are 1.6 and 1.5 m2/g. The calamine has an ability to keep its magnetization unlike the pigment which has a low magnetization.Simultaneous Thermal analysis shows a mass increase of 3.602% between 400 and 1000 °C for calamine and exotherm equal to 1.128 W/g. For the iron pigment, this analysis shows an overall mass loss equal to 11.05% accompanied by heat absorption equal to 1.926 W/g. For the iron pigment, this analysis shows an overall mass loss equal to 11.05% accompanied by a heat absorption equal to 1.926 W/g. Concerning the mixtures with 5, 10, 15, 20, 25 and 35% of calamine, we find a decrease of the loss of mass. The flow of heat takes a polynomial pace increasing.The SEM observations show a homogeneous structure of the calamine composed of grains of iron oxides of different sizes ranging from 1 ?m to 10 ?m and aggregates of small particles. As for the iron oxide pigment, it is composed of aggregates of grains more or less rounded formed of oxides of iron and gangue. The EDS analysis shows a dominance of the iron element for both materials. The optical measurement spectra show that the three compounds do not absorb any visible radiation and absorb significant fluxes in the near UV. They reflect all the incident radiation in the visible but reflect very little near UV radiation. The X-ray diffraction of calamine shows that the crystalline phases of its constitution are mixtures of wustite, magnetite and hematite. As for the iron oxide pigment, it is composed of the following crystalline phases: goethite, hematite, fayalite, silica, phosphorus pentoxide, and hausmannite. The prediction model that we developed deals with the modeling of mass loss and thermal behavior as a function of the mixing rate by a combined model of "neuronal network NN" and the MTCS simulation, which allowed us to calculate this mass loss and the corresponding energy variation. The model based on the neural network approach, by its high precision, offers us a reduced range of uncertainties compared to the linear model.

Keywords : Pigment iron, scale (calamine), iron oxides, grinding, Simultaneous thermal analysis, X-ray diffraction, spectrophotometry.