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CHARACTERIZATION OF IRON ORE AND SCALE FOR SYNTHESIZING VINYL PAINT

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Abstract: As part of the development of iron ore deposits in Algeria and a concern for the preservation of the environment, we are planning to characterize two materials for a possible synthesis of vinyl paint in this study. Iron ore is a red iron oxide pigment with an oolitic structure containing phosphorus. The second material is a steel by-product (scale) that should be recycled. This study covers the characterization of these two components through Chemical analysis, Particle size analysis, Thermal analysis (TGA, DSC), the Observation by SEM, X-Ray Diffraction analysis and Spectrophotometric analysis. Chemical analysis showed that the pigment contains 53.18% of total iron and mostly the gangue is dominated by silica and alumina. Scale in turn contains 73.83% of iron in the form of iron oxides (FeO, Fe3O4 and Fe2O3). Grinding tests illustrated that the scale is much more suitable for grinding than pigment. The granulometric analysis gave a volume distribution of the particles with a size between 0.7 and 32 µm for scale and 0.6 to 40 µm for the pigment and their specific areas are 1.6 and 1.5 m2/g. TGA and DSC showed that the iron pigment loses weight with phase dissolution by consuming energy when the temperature increases. Scale gains weight by the formation of a new phase with heat. Scanning electron microscope of red iron pigment showed a grain aggregate formed rounded over at least iron oxide and gangue. The EDS analysis illustrated a predominance of iron with four predominant oxides in the case of iron ore deposits. Chemical elements forming these four oxides are silicon, calcium, aluminum and magnesium. The SEM of scale showed a homogeneous structure composed of sizes of iron oxide grains and shapes ranging from 1 µm to 10 µm. X-ray diffraction analysis showed that the iron in the pigment is in the form of hematite (Fe2O3) and goethite (FeO(OH)). A tiny portion is combined with silica as fayalite (Fe2SiO4). The iron in the calamine is in the form of the three oxides (FeO, Fe2O3 and Fe3O4). Spectrophotometric tests showed that both materials have virtually no absorption and maximum reflection (100%) in the visible range

Keywords : Pigment iron, scale (calamine), Simultaneous thermal analysis, X-ray diffraction, Spectrophotometry