Role of α-Fe_2O_3 Size and Morphology on the Color of Red Pigment for Korean Porcelain

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Abstract

α-Fe_2O_3 powders for some pigments are commercially produced by either forced hydrothermal or calcinations of $FeSO_4$, $FeCl_3$, and $Fe(NO_3)_3$. Many α-Fe_2O_3 powders are available for use as red pigment for Korean porcelain enamel. Most of the commercial α-Fe_2O_3 powders for red pigments are composed of elongated crystals, 80-230nm long and 40-100nm thick and these crystals are strongly aggregated. The mean size and shape of α-Fe_2O_3 powders have strong influence on the visible light absorption spectrum, infrared absorption spectrum. Especially, the tone of the red color is strongly influenced by the aggregation, size, morphology, and the amount of α-Fe_2O_3 powders. However, the effects of the size and morphology of α-Fe_2O_3 powders on the color or red pigment on Korean porcelain have not been investigated. The intent of this work is to prepare α-Fe_2O_3 powders with controlled shaped and size via hydrothermal synthesis and to determine the optical properties as a function of size and shape. A hydrothermal synthesis has been developed to prepare α-Fe_2O_3 powders using iron nitrate nine hydrate and NH_4OH as the starting materials. The size control is performed by regulating the excess concentration of ferric ions or reaction time during the nucleation stage.