Novel iron oxide based colorants for food applications

Master/Internship projects
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Color of food products is very important for perceived product identity and quality. Coloring of food products is often achieved by using iron oxide-based pigments. Edible pigments based on iron oxides are commercially available in red or orange brown (Fe_2O_3), yellow (FeOOH), and black ($FeO{\cdot}Fe_2O_3$) colors and are labelled with E number E172[1]. They have excellent light, heat and shelf stability. In general, the optical properties of pigment particles will depend on particle composition, size, and morphology (see Figure 1 and Refs. 2,3).
Because the pigment is usually available as powder, the powder has to be well dispersed in the product to be most efficient in creating the color. This is however very challenging for the food industry because dispersing fine particles, usually partly aggregated during the drying process [4], is very energy demanding process, which are not typically available for use in the food industry.
In this project, we seek to develop a new class of iron oxide based pigments that are easily dispersible in water by using a simple wet chemical method. We will attempt to achieve this by assuring that the pigment particles are stabilized against aggregation with a biopolymer based dispersing agent, preferably a plant based carbohydrate (e.g. gums) or protein. The pigment can be in powder or as a liquid dispersion. It is important that the pigment iron oxide particles do not contain any traces of non-food grade, or non-edible, unreacted reagents or byproducts.

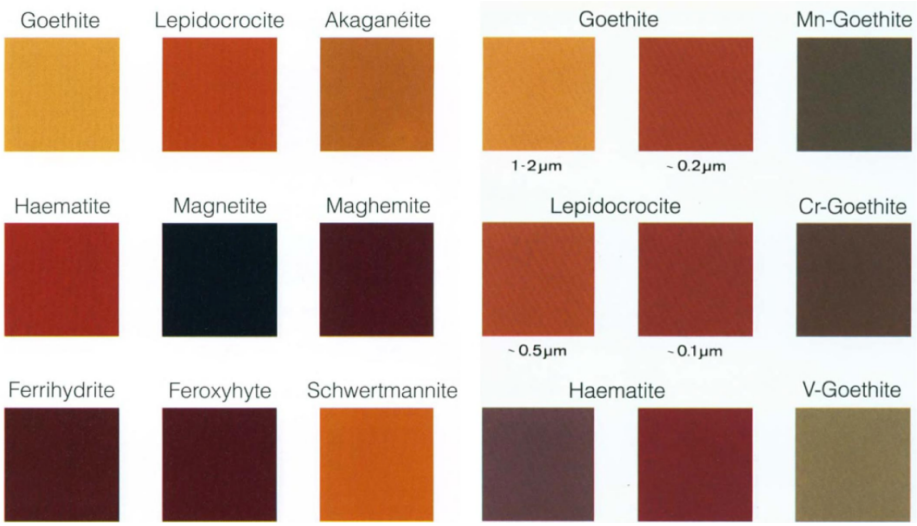

Figure 1. Representative colors of various iron oxides and their change with particle size and cation substitution. Images taken from [2].

[1] EU. (2008). Verordnung (EG) Nr. 1333/2008 des Europäischen Parlaments und des Rates vom 16. Dezember.
[2] Iron Oxides in the Laboratory: Preparation and Characterization, U. Schwertmann and R. M. Cornell, Second Edition: Wiley-VCH Verlag GmbH & Co. KGaA., 2000.
[3] R. M. Cornell and U. Schwertmann, The iron oxides: Structure, properties, reactions, occurences and uses, Second Edition: Wiley-VCH Verlag GmbH & Co. KgaA, 2003.
[4] Baohe Wang , Wenbo Zhang , Wei Zhang , Arun S. Mujumdar & Lixin Huang, Progress in Drying Technology for Nanomaterials, Drying Technology, 23:1-2, 7-32, 2005.