



## Ph.D. Course in Materials Science and Nanotechnology

University of Milano-Bicocca, Department of Materials Science, via Cozzi 55, 20125 Milano

## May 29, 2019 – 12.30 p.m. Building U1 room 11

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## **Crystal Engineering of Industrial Organic Pigments**

Organic pigments are deeply coloured, insoluble, microcrystalline or nanocrystalline organic powders. They are used for the coloration of laquers and coatings (e.g. cars), plastics, printings inks etc.

The chemistry of organic pigments is similar to that of organic dyestuffs, but the pigments are fully insoluble in their application medium (e.g. coating). In the application medium, the pigments are not dissolved, but finely dispersed, like inorganic pigments. Typical particle sizes range from 50 nm to 500 nm. The particle size and the crystal structure have a major impact on the properties.

Most pigments exist in different polymorphic forms, which may have different colours. For example, quinacridone has 4 polymorphs, with different red and violet shades. The individual molecule itself is orange. The red/violet colour is a solid-state effect only.

If the crystal structures of the organic pigments are known, crystal engineering can be applied. Crystal engineering is the design of compounds with desired solid-state properties, based on the knowlegde of the crystal structure and of the structure-property relationships.

In my presentation I will show, how the colour, the solubility, the photostability, the extinction coefficient and the price of organic pigments can be tuned by preparing the desired polymorphic form, by synthesising chemical derivatives or solid solutions.



R2 = R4 = R5 = H: Pigment Yellow 12 (for printing inks) R2 = R4 = CH3, R5 = H: Pigment Yellow 13 R2 = CH3, R4 = R5 = H: Pigment Yellow 14

Solid solution of P.Y.12 and P.Y.13: P.Y.188 (for printing inks)