

Workshop:
A New Class of Pigments: Coloring Concrete with True Color Pigments -
The production of stabilized colorants after Maya peoples and
their integration into concrete.

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Pigments have always been a topic for discussion, as their longevity and chemical stability are constantly being improved. Researchers often refer to the ancient Maya blue pigment that exhibits weather resistance, high chemical stability and lightfastness. This remarkable host-guest material is composed of the phyllosilicate clay palygorskite and integrated indigo molecules in the channels. This principle forms the basis of True Color Pigments (TCP) which utilize the microporous hydrated aluminosilicate mineral zeolite L as the inorganic host structure and intercalate organic guests into the linear channels. Albeit True Color Pigments are derived from intensely colored and highly stable pigments, little is known about their behavior and performance as colorants in different media.

Concrete and mortar were chosen as media due to drawbacks of traditional colorants in the prevalent alkaline environment. Samples prepared with mortar or concrete containing indigo, indigo-TCPs, pigment red 181, basic yellow 40, and mixtures thereof allowed an analysis with UV / VIS and DRS spectra.



Ancient crocodile rattle from the 8th century, which was painted with Maya blue color and found in Mesoamerica.



Hexagonal indigo-TCP sample (10% TCP)

The successful incorporation of various TCP colors indicated the possibility and effectiveness of the integration of different pigment molecules (other than indigo) into zeolite channels, leading to a colorant with seemingly identical characteristics. Measurements suggested that there is a high hue accuracy and calculable absorption spectra for mixed TCP colors. Due to assessments with the CIELAB color space, the saturation curve was optimized, with a saturation maximum determined at 10% TCP of amount of mortar used – it was ascertained that considerably less TCP is needed in relation to conventional indigo pigments to achieve a high tinting strength. Furthermore, UV-stability measurements displayed the light fastness of TCPs, while the perseverance of the pigments in concrete / mortar revealed their alkaline resistance. Although their economic aspects are inferior to other

