INTERNATIONAL Convention on Colorants - 2007

ABSTRACT

Session 6: Paper 1

# RECENT DEVELOPMENTS AND NEW CONCEPTS OF HIGH PERFORMANCE ORGANIC PIGMENTS

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Since 2000 and even before, the field of high performance pigments is characterized by moderate global growth in volume and significant global price decrease. This tendency is supported by ongoing globalization and building up of overcapacities in this industry. Therefore, in the traditional fields of coatings, printings and plastics the main focus of traditional suppliers is on general cost reduction. However, apart from process optimization many innovative developments can be monitored over the last five years. Major fields of R&D activities are:

1. Development of new pigments for specific applications;
2. Providing traditional pigments in ultrafine grades for transparent, high brilliancy applications;
3. Providing solid, easily dispersible pigments for paint applications;
4. Modification of surface properties by additives.

The paper shall provide an overview about recent developments in the field of high performance pigments in classical and novel application areas. In addition, an outlook on the field for the next couple of years shall be provided.

**Carsten Plüg did his Doctoral thesis under Prof Dr W. Friedrichesen (Kiel) on organic synthesis and cycloaddition chemistry. He went on to do his postdoctoral fellowship under Prof Dr C. Wentrup on matrix isolation, photolysis, pyrolysis and dipolar heterocycles. He has a rich professional experience, which includes an empolyment with Prof Dr H.-J. Adler where he worked on thiophene chemistry and coating of Si and Au surfaces. He did a training course in project management, before joinging BTP as a R&D chemist. He then joined Clariant, France as R&D chemist, where he worked on synthesis on triphendioxazines and polycyclic pigments. He soon became R&D group leader - pigments, and is now Head (Research) on Pigments with Clariant.**

### New pigments and pigment grades for traditional areas

In plastic industries the coloration of polyolefins with organic pigments is a major market segment. While inorganic pigments usually do not cause problems with regard to shrinkage and warpage, that means the deformation of injection molded pieces during cooling down, many organic pigments possess this unwanted property. The origin of warpage is supposed to be related to the surface structure that was investigated e.g. copper phthalocyanine pigments. Recently new materials have been introduced to the market that provide brilliant colour and good processability. One example is C.I. Pigment Red 285, a novel azo pigment with yellowish-red hue and high temperature stability. For coating applications, pigments with brilliant shade and excellent weather-fastness are required for outdoor applications. For this market segment, recently introduced pigments possess outstanding hiding power e.g. C.I. Pigment Yellow 213 or extreme transparency like C.I. Pigment Blue 80. There is a general global shift to substitute solvent paints more and more by water-borne systems. However, global paint companies like to provide the same shade in both systems e.g. for automotive applications in Europe and the US. This means there is a requirement either for pigments that work equally in both systems or for tailor-made pairs of pigments, one for water-borne and one for solvent-borne paints, which allows to produce the same shade in either system. In this field, strong progress has been achieved over the last years.

### Ultrafine pigments

By the replacement of dyestuff by pigments for applications like ink-jet printing and colorfilter applications for flat panels, there is a requirement for ultrafine pigments that combine reasonable lightfastness and application properties with brilliancy and excellent contrast behaviour. These demands are usually satisfied by pigments with a particle size much smaller than 80 nm. Apart from mere size, secondary properties like surface structure and charge, dispersibility and crystal shape play an important role to achieve best performance. Important pigments for colorfilters are P.G. 36, P.B. 15:6 and P.R. 254 that form the basis for RGB-colours. An example for difference of the crystal aspect of P.B. 15:6 for paint and colorfilter applications is given herewith

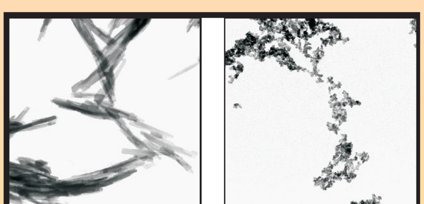


Figure 1: TEM of P.B. 15:6 for paint applications (a) and colorfilter applications (b) ( □ = 1000 nm )

### Easily dispersible pigments for paint applications

For the colouration of decorative paints, the market offers a variety of pigment dispersions that cosisns of up to 50% pigment content and contain surfactants that ensure stability and compatibility with various binder systems. These dispersions guarantee an an optimal distribution in the paint by mere stirring on minimal shear energy. There have been recent attempts to offer solid preparations that ensure an equal performance by just interspersing the powder into the paint and subsequent gentle stirring. This technology offers the advantage of saving transport costs for water. As a drawback, these solid dispersions require additional production steps that lead to extra-costs. In a further approach, there are activities to add polymeric surfactants directly during the production process of pigments. In consequence, the resulting products possess easy dispersibility on application of a dissolver at a competitive cost basis. However, this approach is limited to solvent paints so far.