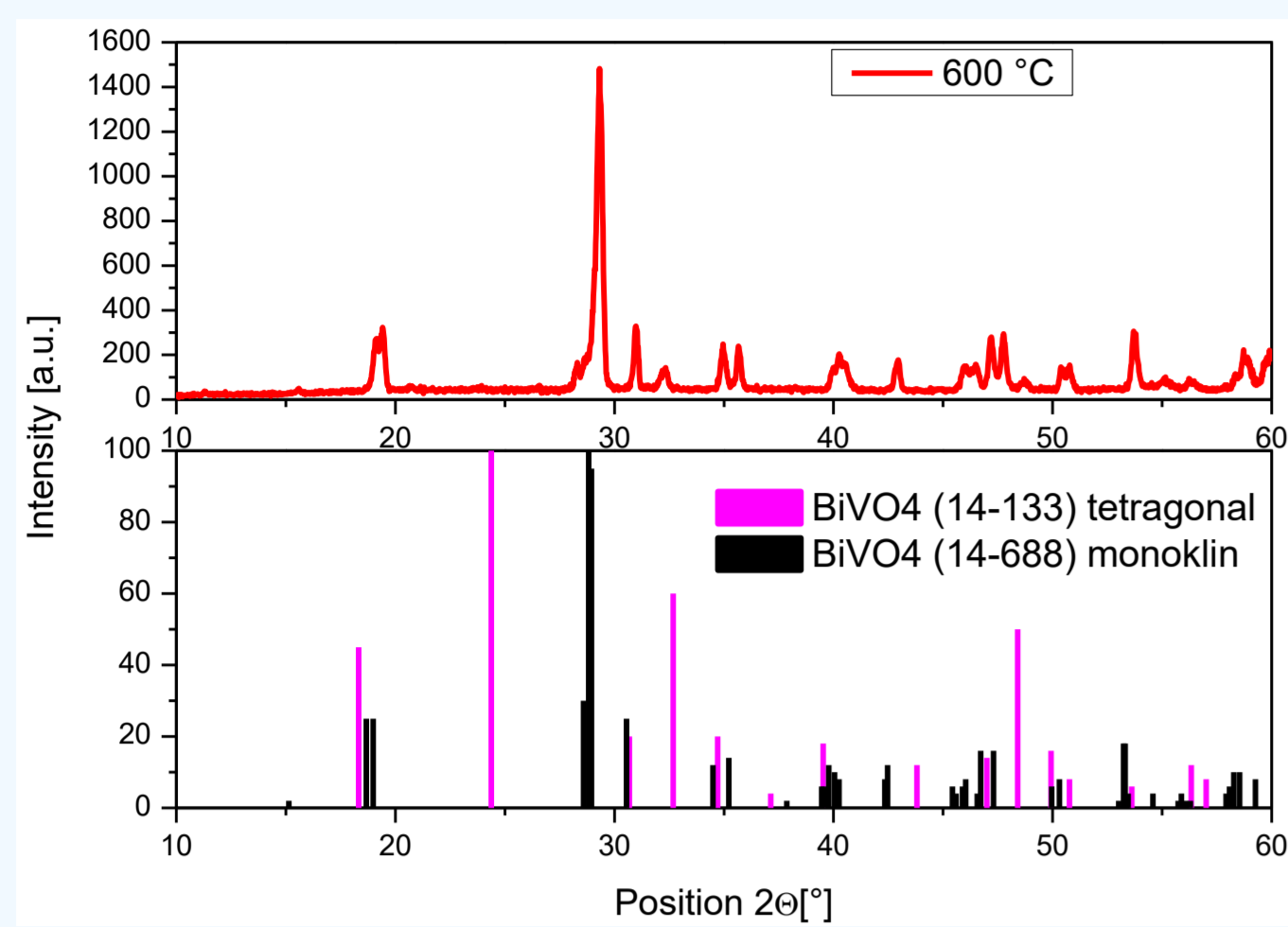


BiVO₄ as a Thermochromic Ceramic Pigment



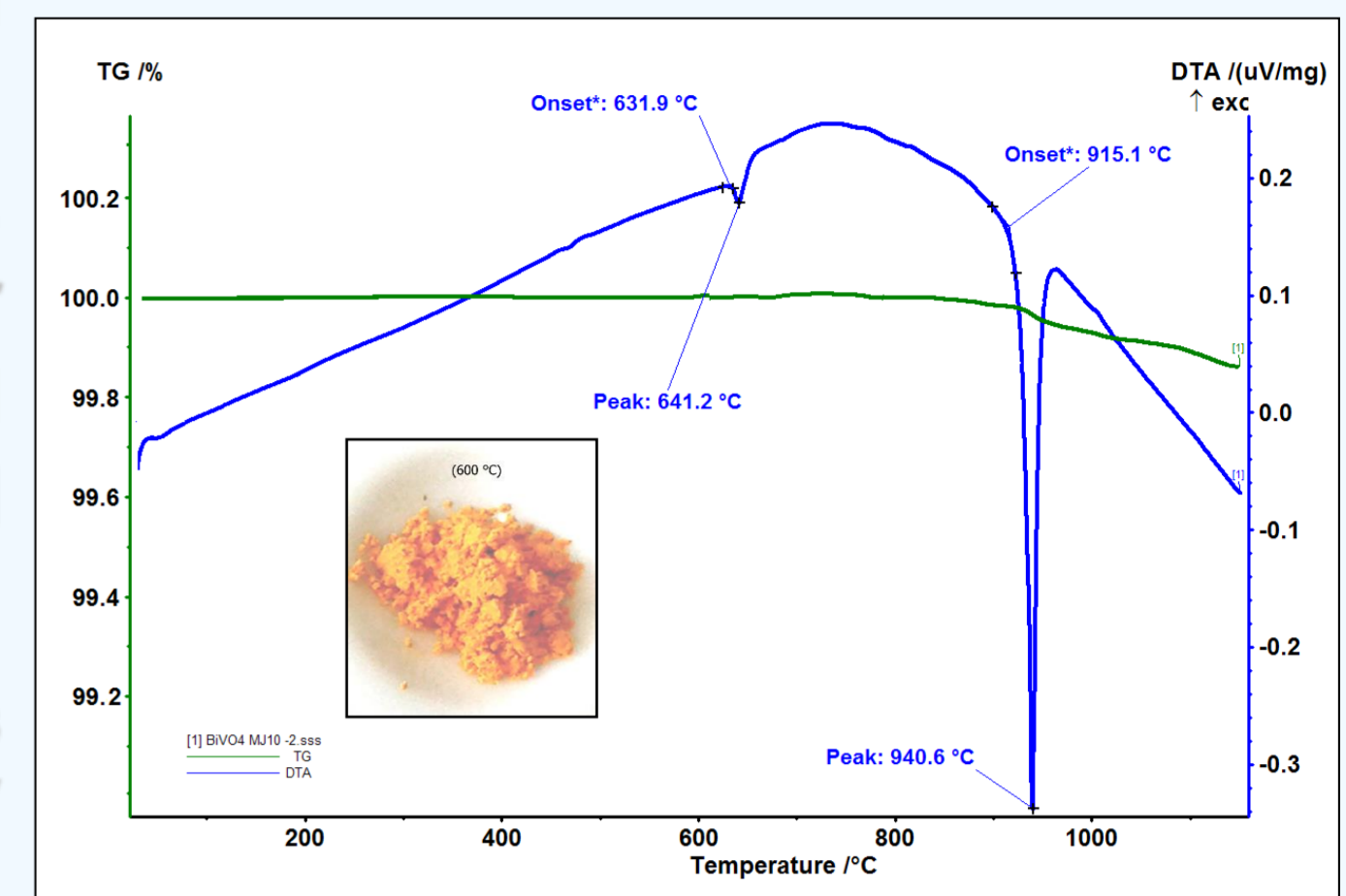
Purity of BiVO₄

BiVO₄ is a well-known yellow pigment (Trade name: C.I. Pigment Yellow 184), whereby the colour point is strongly dependent on the preparation method and on the presence of dopants.

The colour change is caused by a phase transition (monoclinic – tetragonal), which is caused by a change of the optical band gap. This phase and colour change at about 300 °C is completely reversible. The poster presentation will discuss changes in the colour point as function of temperature and of type and concentration of different metal cations as dopants.

For the preparation of the precursor powders (d₅₀ ≈ 5 μm) the binary oxides Bi₂O₃ and V₂O₅ (and eventually the respective metal oxides as dopants) were mixed by milling and subsequently annealed at 600 °C for 8 h.

All prepared BiVO₄ powder samples were investigated for phase purity and characterized with diffuse reflectance spectroscopy as function of temperature. The powders were converted into ceramics by pressing (200 bar) and sintering (600 °C). The doping level was between 1 and 10 %, whereby higher doping levels results in distinct greying. The observed colour changes as function of temperature of the ceramics were also documented by photographic images.

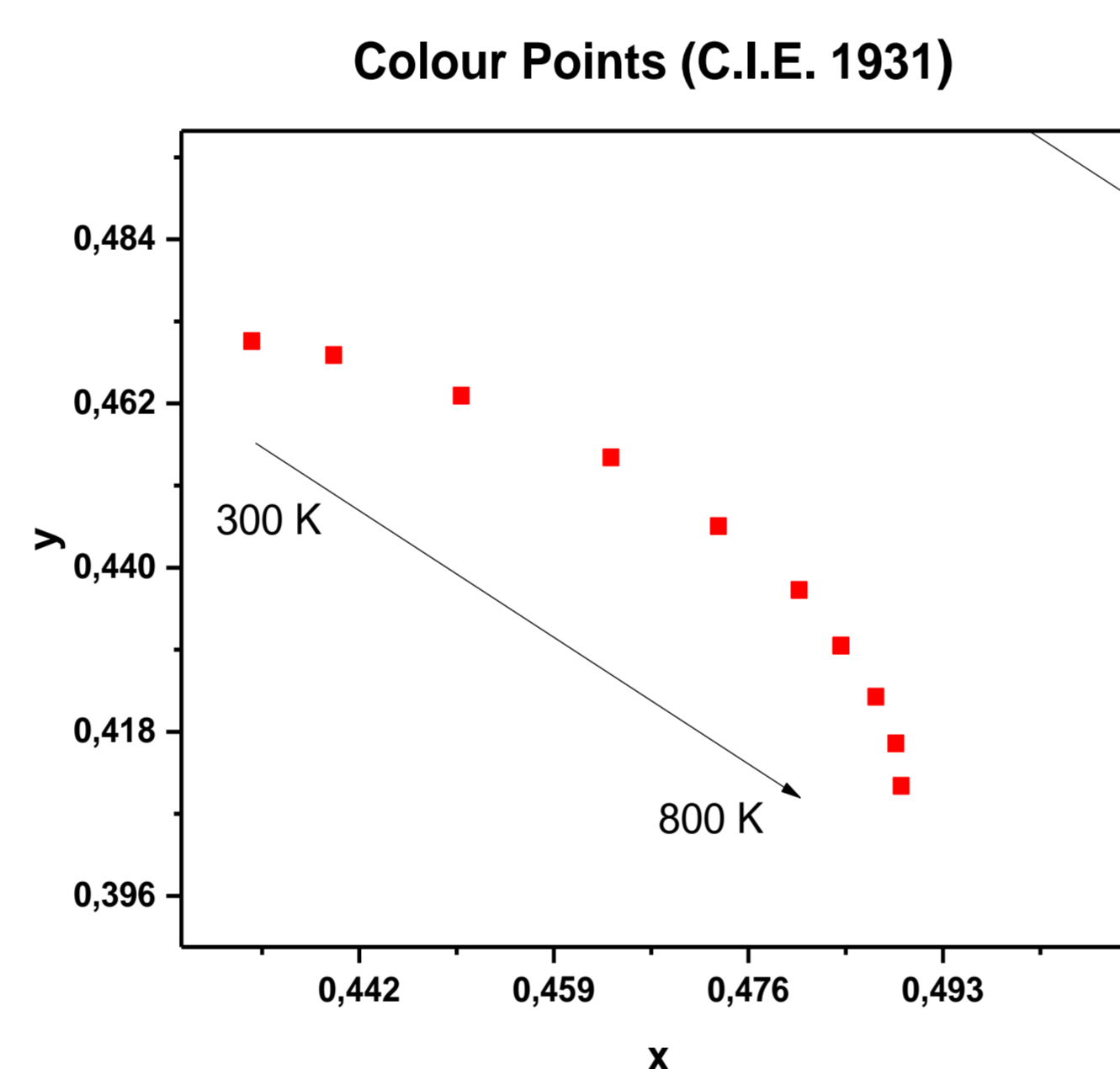
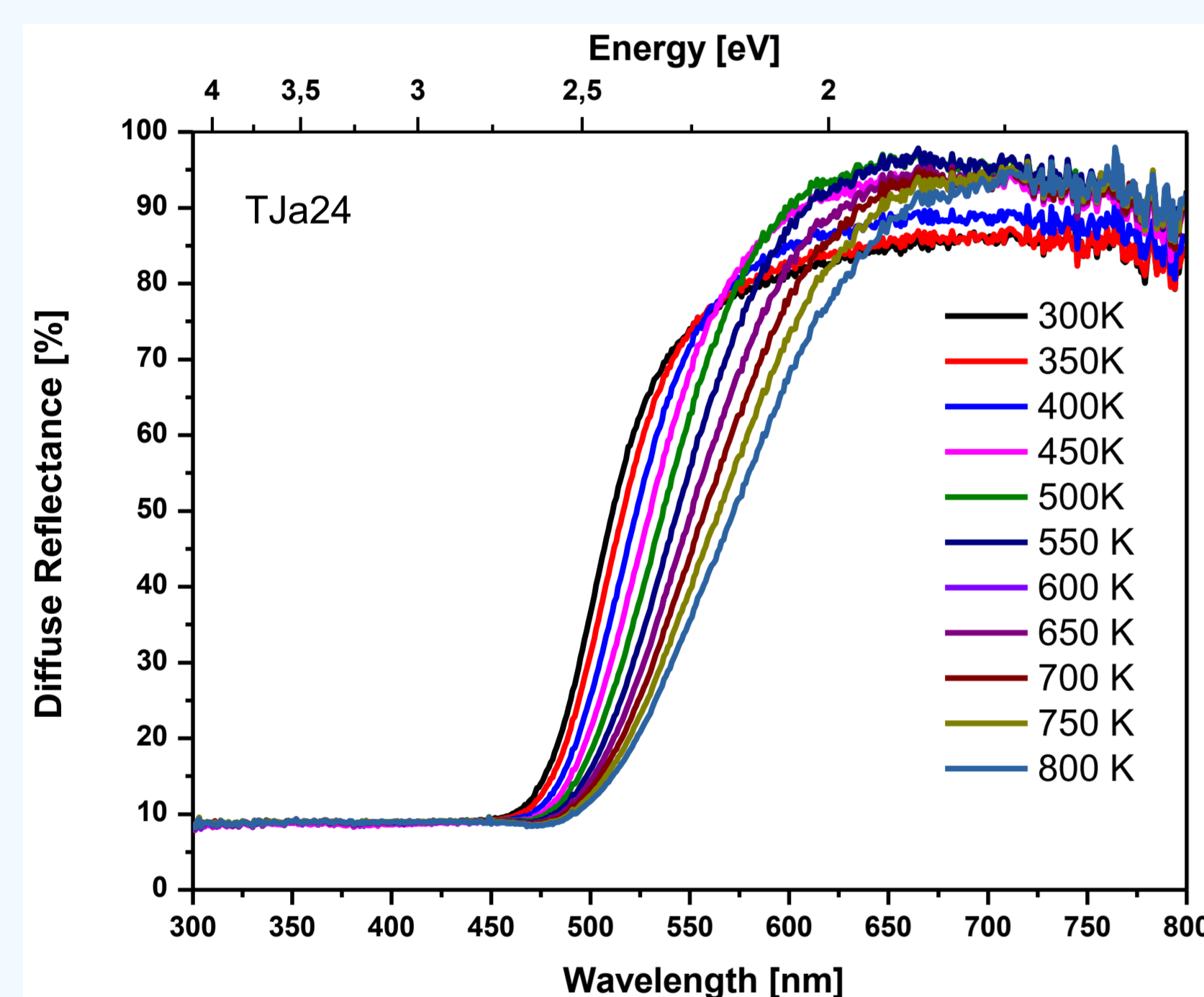


Thermal stability of BiVO₄

Powder

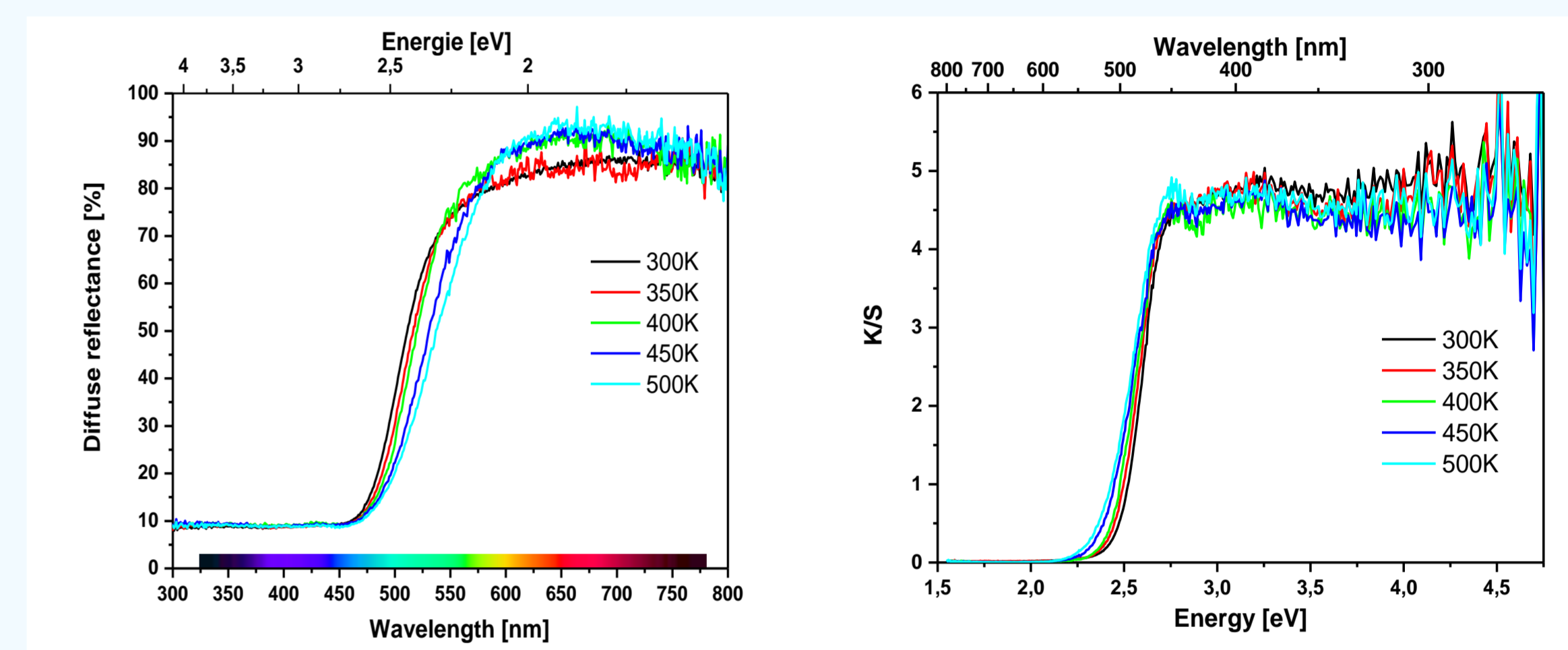


The body colour of BiVO₄ strongly depends on the sintering temperature - light yellow at 500 °C to dark orange at 800 °C

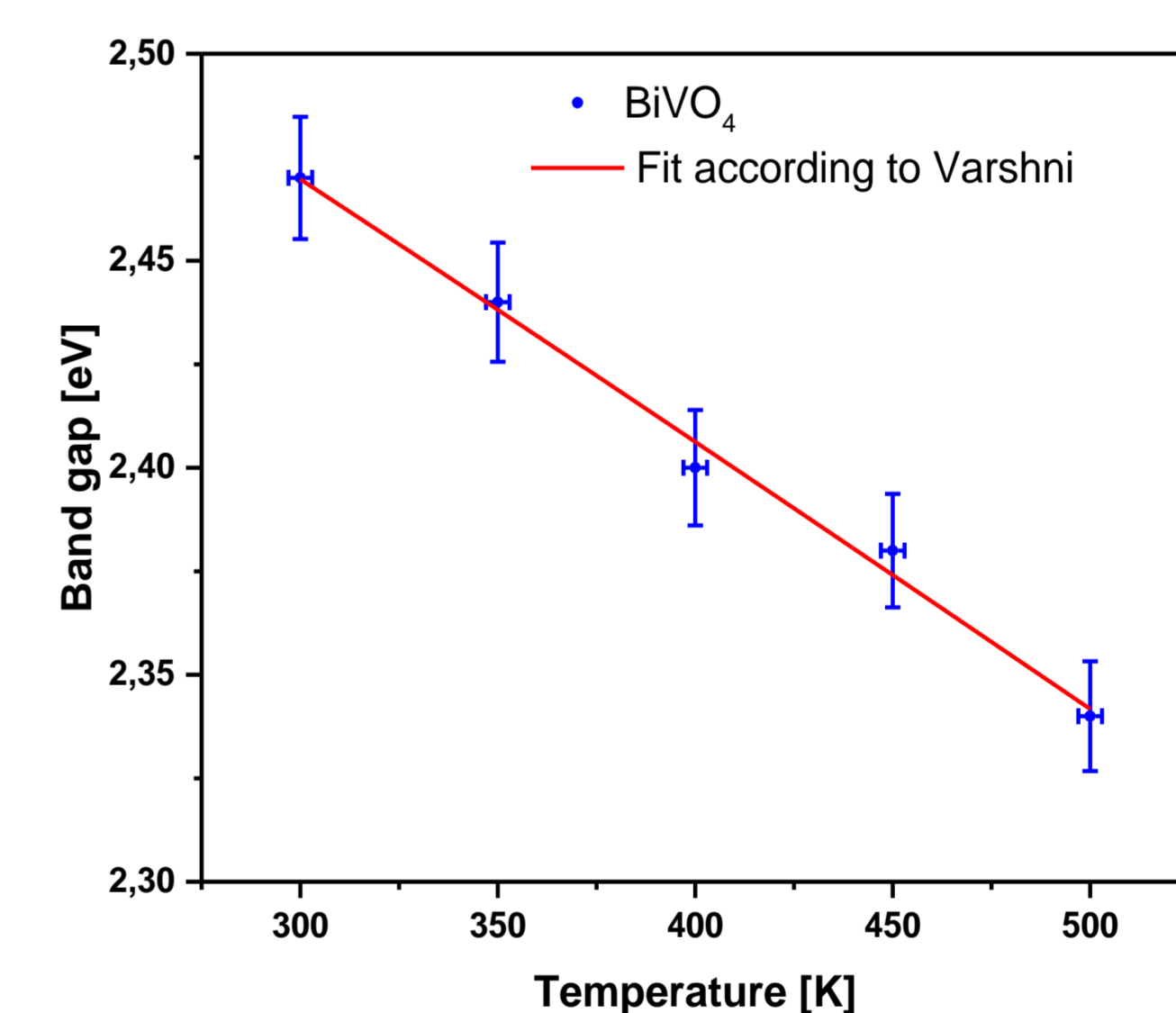


Diffuse reflectance spectra as function of temperature (left) and calculated colour coordinates for BiVO₄ (right).

Optical Characterisation

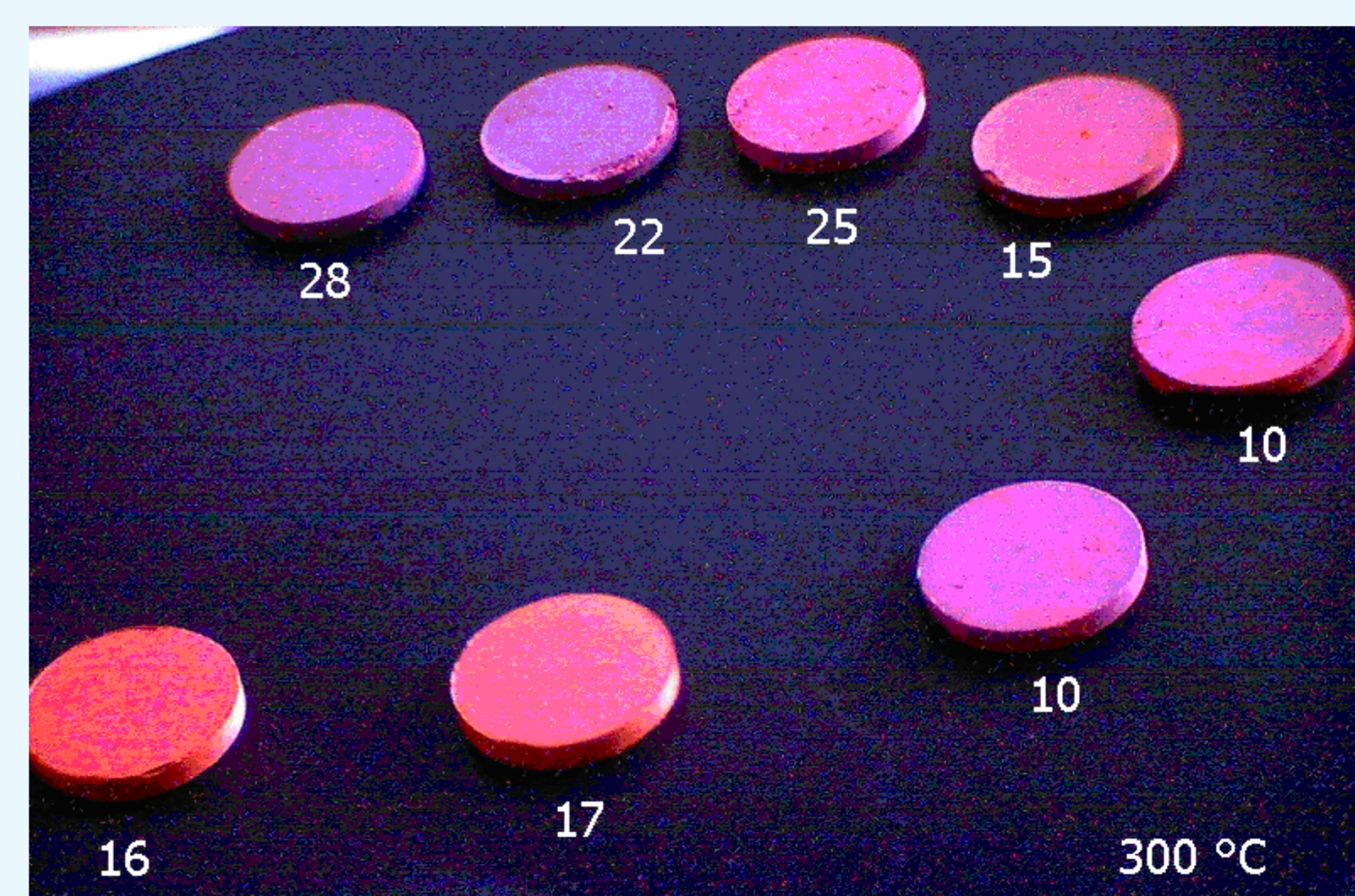
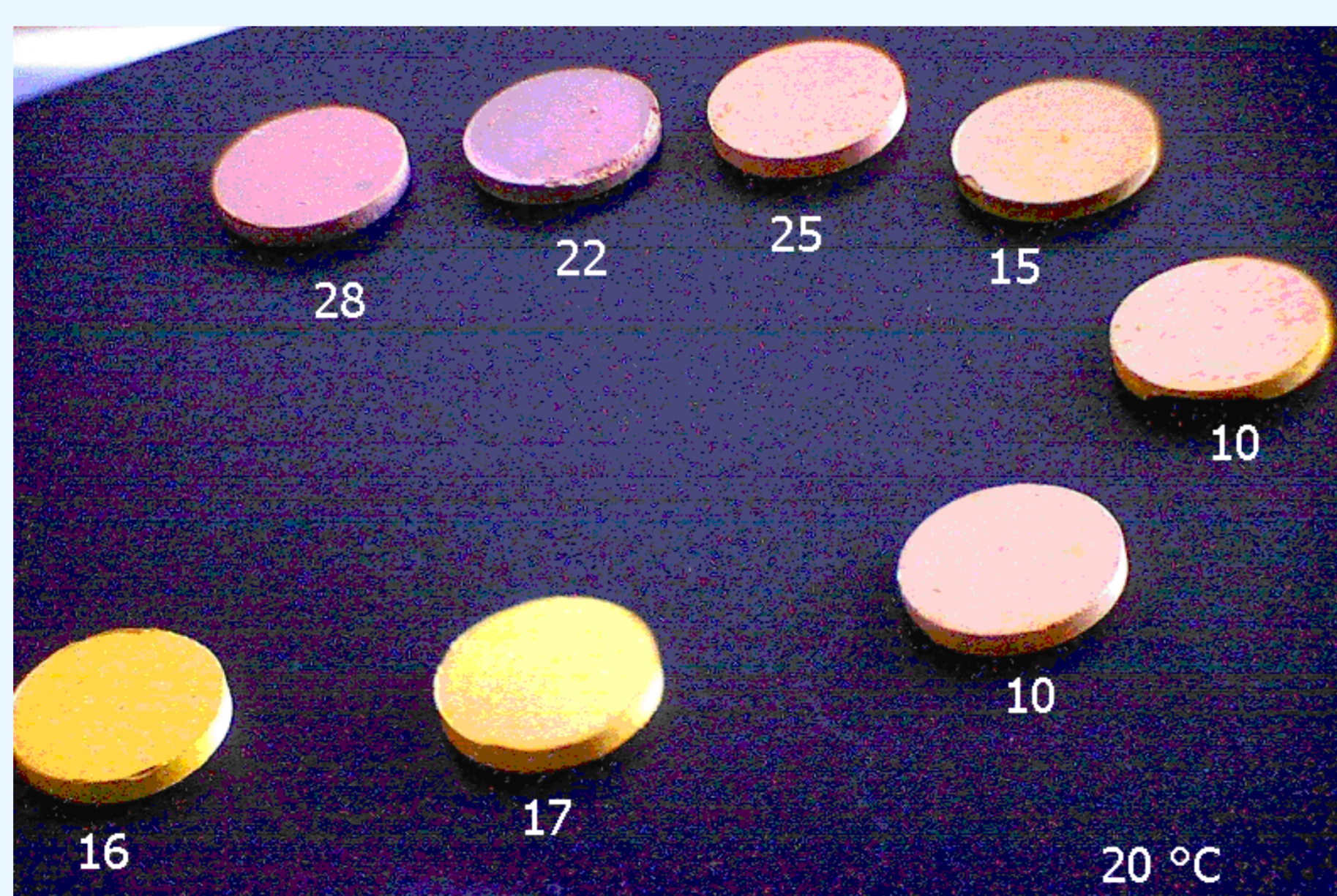


Diffuse reflectance spectra as function of temperature (left) and absorption spectra (derived with Kubelka-Munk correlation) for BiVO₄ (right).



Drop of band gap energy with increasing temperature for BiVO₄.

Thermochromic Ceramics



BiVO₄ ceramics (sintered at 600 °C, 12h) at room temperature (left) and at 300 °C (right) with various dopants 10% Mo (16), 10% W (17), undoped BiVO₄ (10), 2,5% Er (15), 2,5% La (25), 2,5% Pr (22), 25% Nd (28).