SYNTHESIS AND CHARACTERIZATION OF PEROVSKITE PIGMENTS VIA DIFFERENT METHODS

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This research was focused on the synthesis and characterization of perovskite pigments with the general formula of $SrSn_{1-x}Mn_xO_3$. These pigments were prepared by classical ceramic method with or without mineralizers, wet and dry mechanochemical activation. These methods involve mixing starting materials – SnO_2, $SrCO_3$ and MnO_2 in a mortar grinder, resp. in planetary mill and then calcining in temperature range of 950 – 1300 °C, with a heating rate of 10 °C/min, maintaining for 4 hours. The phase composition were characterized by X-ray diffraction with using diffractometer MiniFlex 600 (Rigaku, JPN) and then phase identifications were evaluated with the aid of database PDF2. Specific pigmentary properties of powders were also evaluated, such as colour parameters, particle sizes distribution and reflectivity in near-infrared region. The particle size distribution was measured using a laser scattering system Mastersizer 2000/MU (Malvern Instruments, UK). Before milling treatment, the mean particle sizes (d_{50}) varied between of 2-12 µm. Granulometric treatment decreased values of particle size distribution (1-3 µm), these values are suitable for application powders into the organic binder. Colour properties of the pigments were characterized after their application into the Luxol (Akzonobels coatings, CZ) in the mass and diluted tone (1:1 with TiO_2). Results thin films were characterized by spectrometer UltraScan VIS (HunterLab, USA) in colour system CIE L*a*b*. Final colour shades of the films were chocolate brown via dark brown to black. According to the ASTM-G Standard 173-03 (Equal 1), solar reflectance (R*) were calculated and their values moved in range of 30 – 42 %. The developed nontoxic and eco-friendly brown pigments can be used as energy saving coatings in building facades or roofs for reducing ambient temperature.

$$R^{¿} = \frac{\int_{700}^{1650} r(\lambda)\cdot i(\lambda)\cdot d\lambda}{\int_{700}^{1650} i(\lambda)\cdot d\lambda} \quad (Equal\,1)$$

where *r(λ)* is experimentally obtained spectral reflectance from measurement [%], *i (λ)* is standard spectral irradiance of the sun [$W\cdot m^{-2}\cdot mm^{-1}$], *R** is calculated solar reflectance [%] (1).

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References:

1) Dohnalová Ž., Šulcová P., Bělina P.: J. Therm. Anal. Calorim. 138 (6) 2019.