Structural characterization of $Mg_xCo_{3-x}P_2O_8$ solid solutions

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Electrical, optic and magnetic properties of phosphates related in the literature made interesting the study of these materials. Specifically, many structures of phosphates are stables at high temperature [1]. Co(II) phosphates avoid some deficiencies detected when cobalt oxides or other cobalt salts are used as raw materials in the synthesis of ceramic pigments [2]. Cobalt violet phosphate, $Co_3P_2O_8$, is included in the DCMA Classification of the Mixed Metal Oxide Inorganic Coloured Pigments (DCMA-8-11-1) [3]. Melting point in $Co_3P_2O_8$ compound at 1160 ºC could be increased from the formation of solid solutions with $Mg_3P_2O_8$ with melting point at 1240 ºC. The stable polymorph of $Co_3P_2O_8$ compound presents $Mg_3P_2O_8$ structure with monoclinic symmetry, so the formation of these solid solutions seems possible in a partial or total compositional range. Unit cell parameters are a = 5.064 Å, b = 8.371 Å, c = 8.794 Å, β = 121.01 in $Co_3P_2O_8$ compound (ICSD-38259) and a = 5.077 Å, b = 8.230 Å, c = 8.833 Å, β = 120.94 in $Mg_3P_2O_8$ compound (ICSD-31005). The variation of the unit cell parameters with composition will confirm the formation of these solid solutions. Structural characterization of the $Mg_xCo_{3-x}P_2O_8$ compositions with temperature, position of the Co(II) absorption bands in Visible spectrum and measurement of the CIEL*a*b* colour parameters [4] give us information about the composition and temperature in which the desired colour is developed.

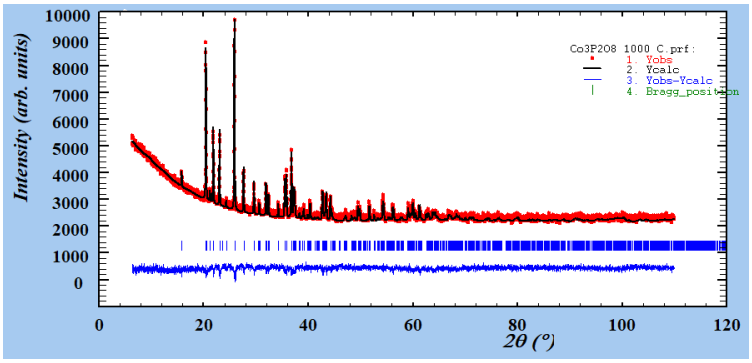

Figure 1. Rietveld refinement from $Co_3P_2O_8$ composition fired at 1000 °C (L* = 32.12, a* = +25.99, b* = -25.56)

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Keywords: $Co_3P_2O_8$; $Mg_3P_2O_8$; solid solutions; pigments; ceramics

We gratefully acknowledge the financial support provided by Spanish Ministerio de Ciencia, Innovación y Universidades, project MAT2016-78155-C2-1-R.