Poster

Pigments based in M_2SiO_4 (M = Ni, Co) olivine solid solutions from SiO_2 – rich compositions

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In this study, $Na_2Co_xNi_{1-x}Si_4O_{10}$ ($0.0 \leq x \leq 1.0$) compositions were prepared via the chemical co-precipitation method to minimise the toxic and expensive amounts of cobalt and nickel. Colour in these compositions is due to Co(II) and Ni(II) ions in olivine structure that crystallize together with NaCl and SiO_2. The fusion of NaCl since 800 ºC from these compositions coincides with the disappearance of Co_3O_4 formed at lower temperatures ($0 \leq x \leq 0.8$) and the crystallization of olivine solid solutions and SiO_2.

The evolution of the color with composition and temperature will be explained by the structural characterization of these fired materials. Coloration of these compositions will be compared with colorations of $MgCo_xNi_{1-x}SiO_4$ ($0 \leq x \leq 1$) solid solutions with the olivine structure[1] and $CaMg_{0.5}Co_xNi_{0.5-x}Si_2O_6$ ($0.0 \leq x \leq 0.5$) solid solutions with diopside structure[[2]] and to test the colouring in samples enamelled with a commercial glaze.

Lineal variation of olivine unit cell parameters was obtained from the $Co_xNi_{2-x}SiO_4$ and $MgCo_xNi_{1-x}SiO_4$ ($0.0 \leq x \leq 1.0$) olivine solid solutions because the Co(II) and Ni(II) ions are randomly distributed in this structure. The Co(II) ions ocuppy both M1(4a) and M2(4c) sites from $Co_xNi_{2-x}SiO_4$ solid solutions and their colour is blue ($x > 0.0$).

These solid solutions can be used as ceramic dyes when they are dissolved in glazes and the colour in enamelled samples is depending on x. Intense green and blue colorations are developed when these pigments are dissolved in the commercial glaze.

[1] M.A. Tena, Rafael Mendoza, Camino Trobajo, José R. García, Santiago Garcia-Granda. Ceramics International, 49 (2023) 12021- 12033. https://doi.org/10.1016/j.ceramint.2022.12.052

[2] M. A. Tena, Mohammed S. M. Abdelbaky, Camino Trobajo, José R. García, Santiago Garcia-Granda. Ceramics International, 50 (2024) 20391-2040. https://doi.org/10.1016/j.ceramint.2024.03.162

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