



New Ceramic Pigments on the Basis of Phosphate Apatites Containing Oxocuprate Ions in the Hexagonal Channels



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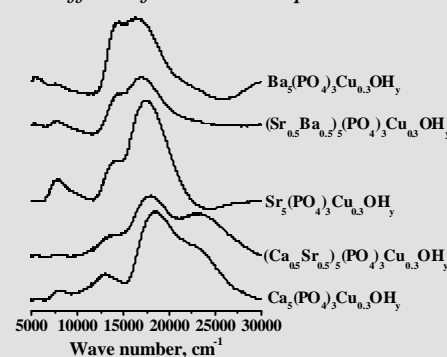
Introduction

Ceramic pigments are widely used to impart colour and are usually incorporated as fine particles in paints, plastics, and other materials. Although many chemical compounds are effectively applied as pigments there is still a need to find new compounds and mixtures which show bright colours and are relatively cheap, stable towards heating and light, non-toxic and environment friendly.

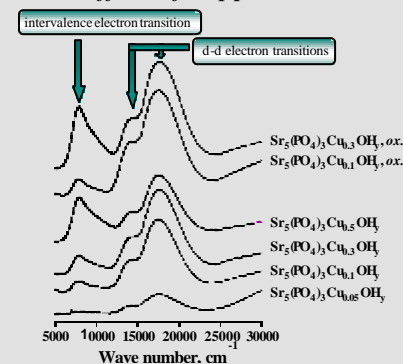
We report on new types of ceramic pigments based on apatites containing linear copper(I,II) oxyanions in hexagonal channels, partly substituting the hydroxyl groups. In spite of the fact that only a small share of copper is in the divalent state, the compounds are brilliantly coloured.

Electron Absorption Spectra

Effect of cation composition



Effect of copper content

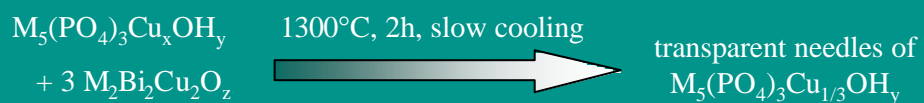


Preparation

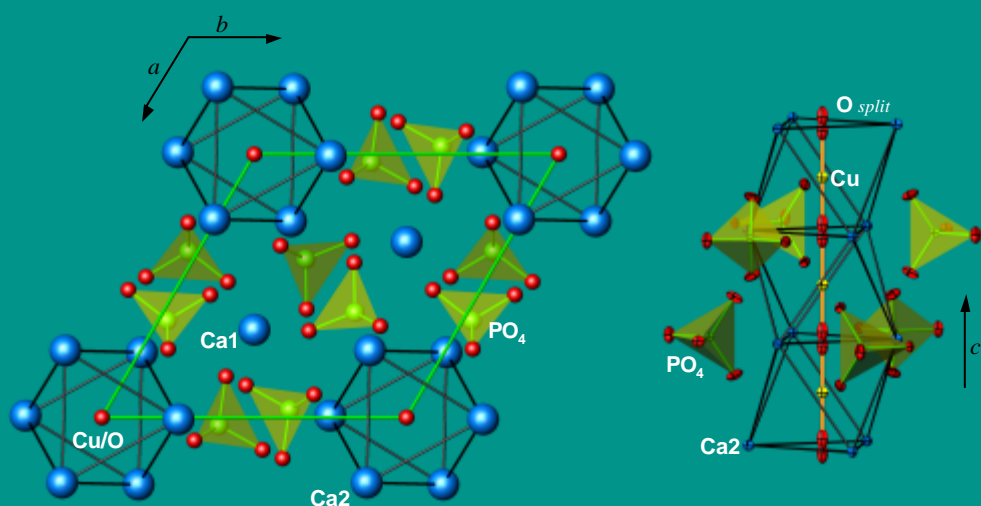
1. Ceramic samples



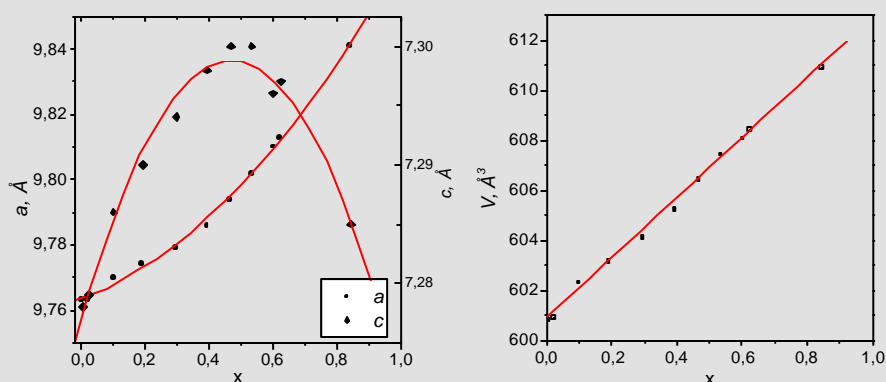
2. Growth of single crystals



Crystal Structure

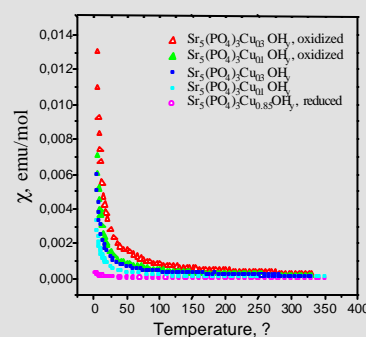


Dependence of cell parameters and cell volume on copper content in $Sr_5(PO_4)_3Cu_xOH_y$

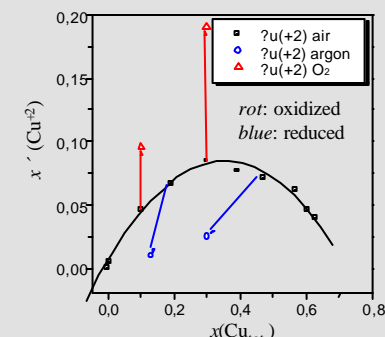


Magnetic Properties of $Sr_5(PO_4)_3Cu_xOH_y$

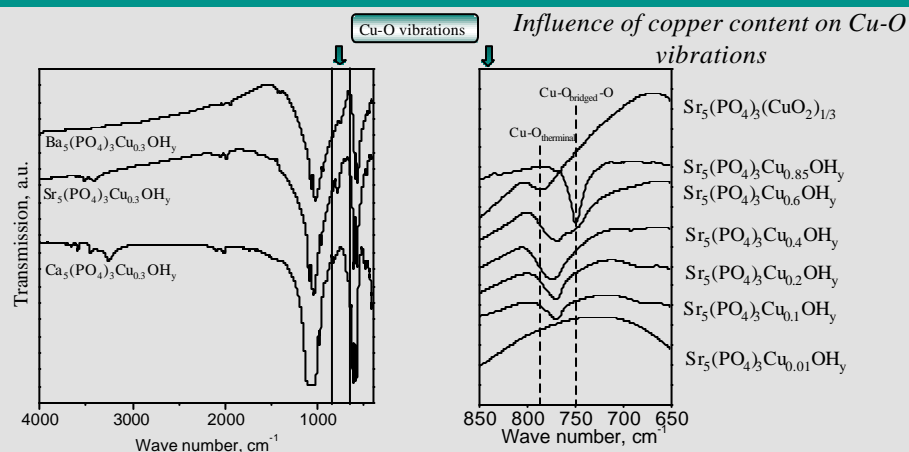
Temperature dependence of magnetic susceptibility



Paramagnetic copper vs. total copper contents

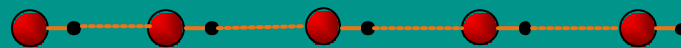


Infrared Spectra



Substitution of Hydroxyl Groups by Copper Ions

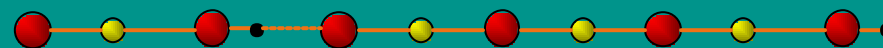
1) Hydroxyl groups in the channels



2) Some of hydroxyl groups replaced by oxocuprates(I) ions



3) Oxocuprate ions build oligomeric chains



4) Formation of vacancies by oxidation of copper(I) to copper(II)



References

- [1] P.E. Kazin, A.S. Karpov, M. Jansen, J. Nuss, Y.D. Tretyakov, *Z. Anorg. Allg. Chem.* 629 (2003) 344
- [2] A.S. Karpov, J. Nuss, M. Jansen, P.E. Kazin, Y.D. Tretyakov, *Solid State Sci.* in press
- [3] P.E. Kazin, A.S. Karpov, M. Jansen, *EP No 02014451*, Ceramic pigments on apatite basis