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Low temperature structure transformation of Ni doped $La_{2-x}Sr_xCuO_4$

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For more than two decades, the $La_{2-x}Sr_xCuO_4$ (LSCO) high temperature superconductors with the K_2NiF_4 (SG *I*4/*mmm*) structure are a subject of research [1, 2]. Doping the LSCO with magnetic elements such as Fe, Co, Ni destroys the superconductivity. For more thorough understanding the structure changes, determination of the temperature- dependent structure evolution in different LSCOs comprising a transition metal may be helpful. In this work, we focus on Ni-doped LSCO. Previous studies [3, 4] show mainly the low temperature structure transformation of $La_{2-x}Sr_xCuO_{4+\delta}$ whereas the information about Ni doped materials is still missing. The aim of present study is to fill the gap in this knowledge. The polycrystalline samples of tetragonal $La_{1.85}Sr_{0.15}Cu_{1-x}Ni_xO_4$ (Ni – 2% and 19%) were synthesized by means of a conventional solid-state reaction method. The XPD measurements were carried out at B2 beamline (Hasylab/DESY), using the Debye–Scherrer experimental geometry. The applied temperature range was from 10 K to 300 K. Crystallographic characterisation and structure refinement was done with help of Fullprof.2k (v. 2.70) program [5]. The temperature lattice parameters, free atomic position evolution and phase transition temperature are determined. The present results are discussed on the basis of earlier data.

[1] J. W. Halley *Theories of high temperature superconductivity* (Addison-Wesley, Reading, MA, 1988)
[2] B. Brodsky, R. C. Dynes, K. Kitazawa, H. L. Tuller *High-temperature superconductors* (Materials Research Society, Pittsburgh, 1988)
[3] K. Yamada, C. H. Lee, K. Kurahashi, J. Wada, S. Wakimoto, S. Ueki, H. Kimura, Y. Endoh, S. Hosoya, G. Shirane, R. J. Birgeneau, M. Greven, M. A. Kastner, and Y. J. Kim, *Phys. Rev. B* **57**(10) (1998) 6165.
[4] R. Moret, J. P. Pouget and G. Colli *Europhys. Lett.* **4** (1987) 365.
[5] J. Rodriguez-Carvajal, *Newslett. IUCr Commission Powd. Diffr.*, **26** (2001) 12.

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Intense synchrotron radiation sources in probing the biostructures and life processes

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Unique properties of 3rd generation synchrotron radiation (SR) sources have opened-up, about 30 years ago, new opportunities of probing the structures and processes of life. Intense and stable SR beams, together with countless improvements both in the experimental and computational techniques, contributed to a substantial progress in understanding molecular foundations of many biological phenomena. Well known examples are here the rapid development of macromolecular crystallography with atomic resolution as well as studies of biochemical reactions dynamics in the picosecond time domain.

The history repeats itself over the last decade, due to a rapid development of the 4th generation sources of synchrotron radiation, the short-wavelength (SASE) FEL lasers.

SASE-FELs can produce tunable monochromatic radiation in ultrafast femtosecond pulses with a peak power up to several GW, in the wide range of wavelength including hard X-rays. With new methods emerging to fully exploit unique emission properties of the FELs, new qualities in probing the secrets of life with unprecedented temporal and spatial resolution are expected.

Some of the key experimental techniques have already been implemented and their invaluable potential confirmed. Included are, among other, new techniques of structure determination without the need of conventional crystallization, applicable both to large biomolecules and molecular complexes, a possibility of obtaining the precise structural information by collecting diffraction patterns of a large number of small nanocrystals (known as serial nanocrystallography) and imaging of small objects with a spatial resolution close to diffraction limit. Underway are also developments of new techniques dedicated to ultrafast dynamic study of biochemical processes with the femtosecond resolution.

This poster presentation is focused on chosen examples of some newly emerging experimental techniques exploiting intense SR x-ray beams for biology-related research.