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Report:

We have measured the x-ray absorption-fine-structure (EXAFS) at the Y-K edge of the high-T_c $Y_{1-y}Ca_yBa_2Cu_3O_x$ for the oxygen overdoped concentration x=6.994 at T=20-300 K and the Ca overdoped concentrations y=2-20 % at T=20-60 K. All Ca doped samples had been chemically fixed to the highest possible oxygen content (x=6.%-6.98) thus putting the whole series of solid solutions (up to 20% Ca) into the overdoped regime. This type of Ca doped preparations is unique, since charge neutrality tends to expel1 the oxygen on substitution of Y^{3+} by Ca^{2+}. Thus we could avoid the ill defined chemical conditions usually arising from dual doping. We have focused our interest on the dimpling in the CuO_2-planes (as a function of temperature and doping) analyzing the three-body scattering configurations Y-Ba-02,3 (at R_{eff}=5 A) and Y-Ba-Cu2 (at R_{eff}=6.2 A). The overall behaviour of the dimpling in the overdoped regime (doping by oxygen and/or calcium) is found to decrease in the same way as was earlier established from neutron diffraction studies of the same samples. However, from the EXAFS data we find the position of the O2,3 layer to change discontinously with Ca concentration and to exhibit several jumps in the narrow low temperature range T=20-60 K. It is not clear whether these irregularities are of intrinsic nature due to the oxygen

concentrations near x=7, or due to order-disorder in the Y/Ca layer. Therefore we have decided to assure the reproducibility of these findings by repeating these scans.

The temperature dependence (25-300 K) of the peak heights 5 Å (Y-02,3-Ba) and 6.2 Å (Y-Cu2-Ba), respectively of purely oxygen overdoped $YBa_2Cu_3O_{6.994}$ is shown below. Within the scatter of the data points the "6.2" signal can be described using an effective Dcbye-Waller factor, whereas the "5" signal can be not. The latter exhibits significant steps around 50 K, 105 K and 185 K, pointing to a discontinous charge redistribition between Cu2 and oxygen around these temperatures.

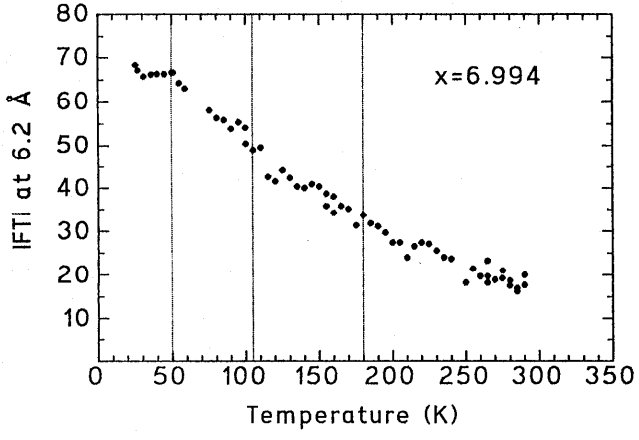

Fig 1. Temperature dependence of the Y-Cu2-Ba (6.2 Å) MS-signal in $YBa_2Cu_3O_{6.99}$.

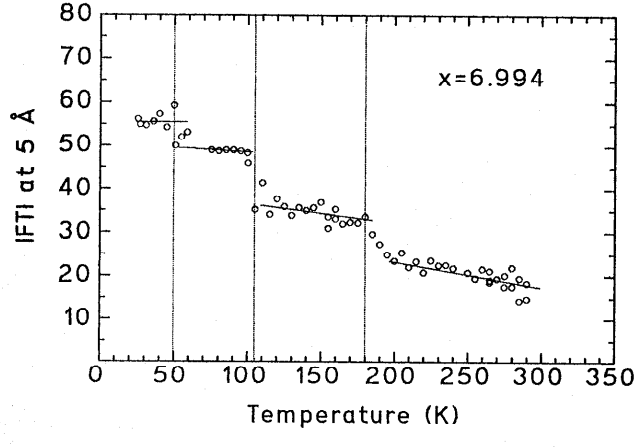

Fig 2. Temperature dependence of the Y-O2,3-Ba (5 Å) MS-signal in $YBa_2Cu_3O_{6.99}$.