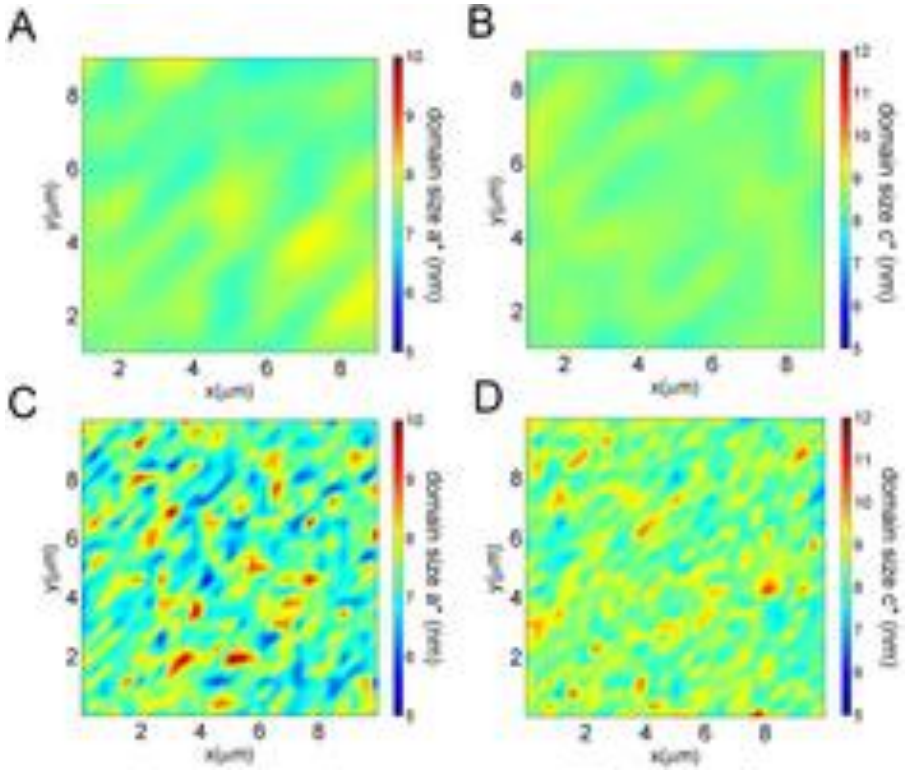
Multiscale distribution of oxygen puddles in 1/8 doped $YBa_2Cu_3O_{6.67}$

- *Authors:* **Alessandro Ricci, Nicola Poccia , Gaetano Campi, Antonio Bianconi**

Despite intensive research a physical explanation of high T_c superconductors remains elusive. One reason for this is that these materials have generally a very complex structure making useless theoretical models for a homogeneous system. Little is known on the control of the critical temperature by the space disposition of defects because of lack of suitable experimental probes. X-ray diffraction and neutron scattering experiments used to investigate *y* oxygen dopants in $YBa_2Cu_3O_{6+y}$ lack of spatial resolution.

Here we report the spatial imaging of dopants distribution inhomogeneity in $YBa_2Cu_3O_{6.67}$ using scanning nano X-ray diffraction [1]. By changing the X-ray beam size from 1 micron to 300 nm of diameter, the lattice inhomogeneity increases. The ordered oxygen puddles size distribution vary between 6–8 nm using 1 × 1 μm^2 beam, while it is between 5–12 nm with a fat tail using the 300 × 300 nm^2 beam. The increased inhomogeneity at the nanoscale points toward a network of superconducting puddles made of ordered oxygen interstitials.



References

[1] Ricci, A. *et al.* Multiscale distribution of oxygen puddles in 1/8 doped YBa2Cu3O6.67. *Scientific Reports***3**, 2383+ (2013).