



X-rays and electrons diffraction for nanopowders



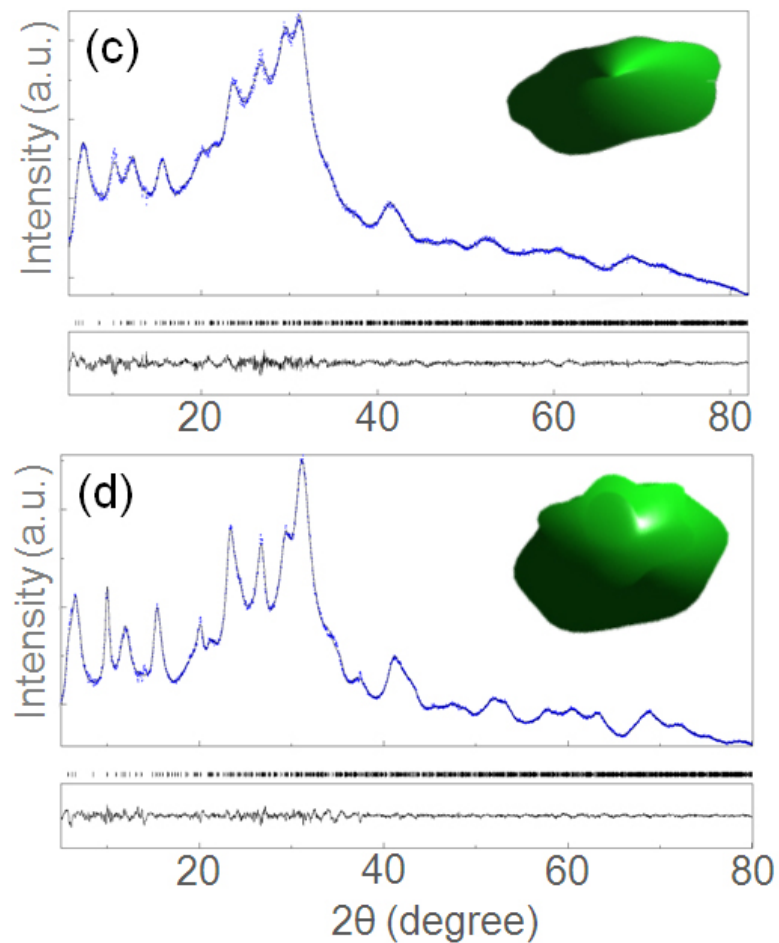
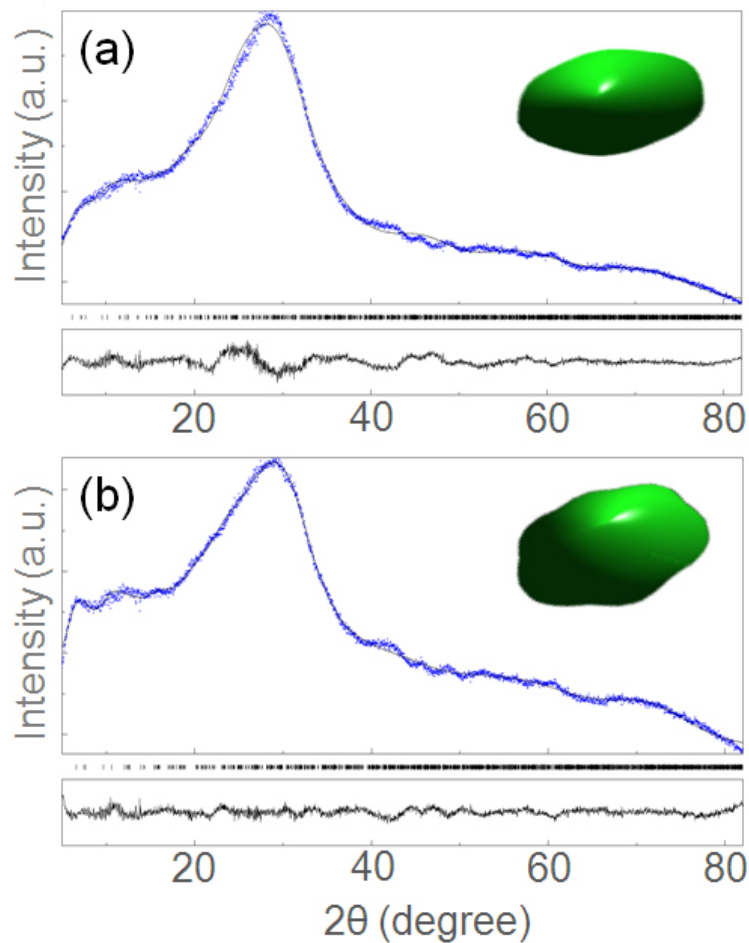
D. Chateigner, L. Lutterotti, O. Pérez, Ph.
Boullay, B. Mc Mahon, J.R. Helliwell

IUT-UCBN, CRISMAT, Caen, France

Dept. Eng. Mat., Univ. Trento, I

International Union of Crystallography, Chester, UK

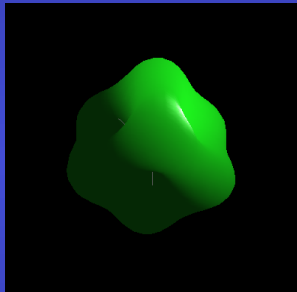
EMT nanocrystalline zeolite



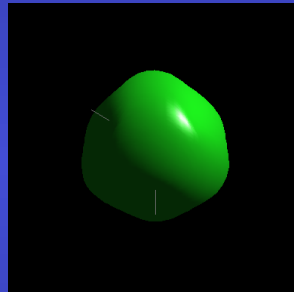
Ng, Chateigner, Valtchev, Mintova: *Science* **335** (2012) 70

Gold thin films

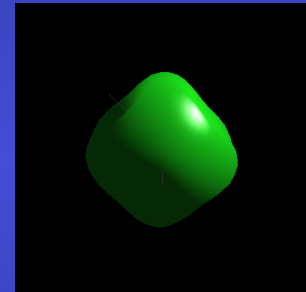
Crystallite size (Å) along	Film thickness					
	10nm	15nm	20nm	25nm	35nm	40nm
[111]	176	153	725	254	343	379
[200]	64	103	457	173	321	386
[202]	148	140	658	234	337	381



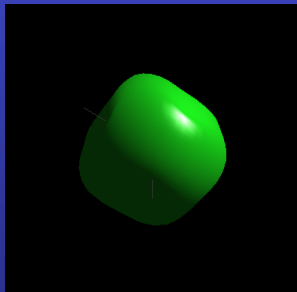
10 nm



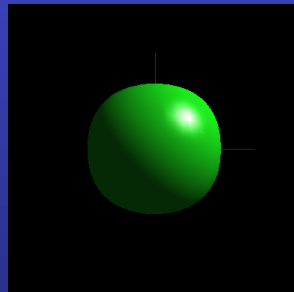
15 nm



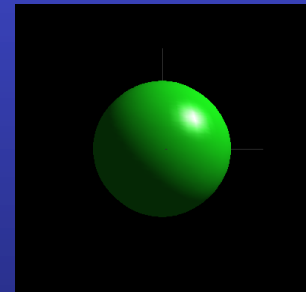
20 nm



25 nm



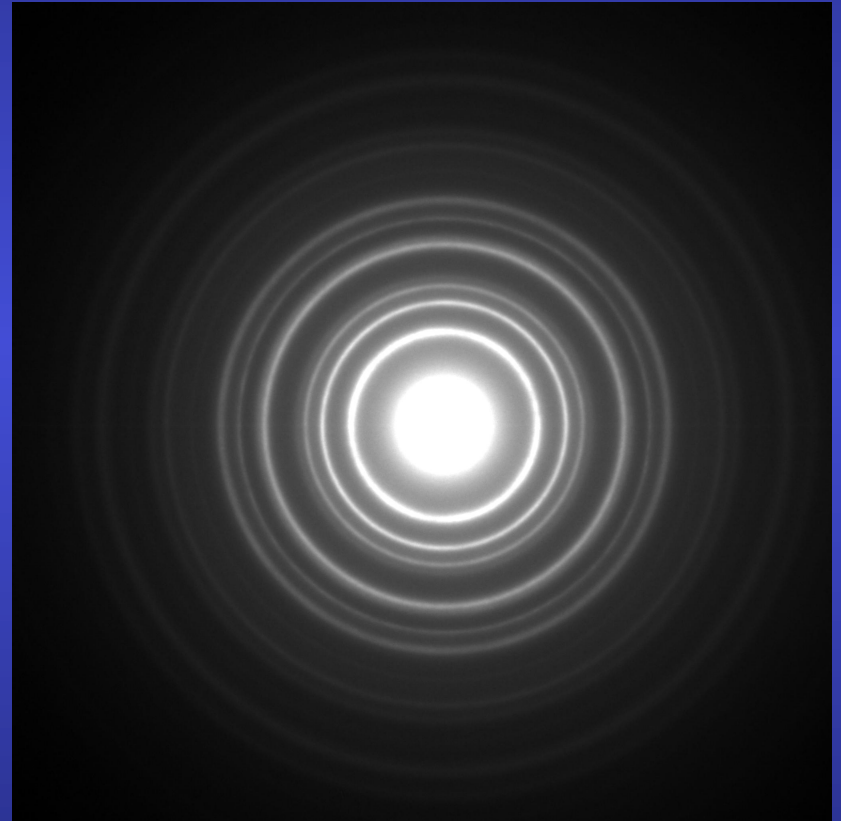
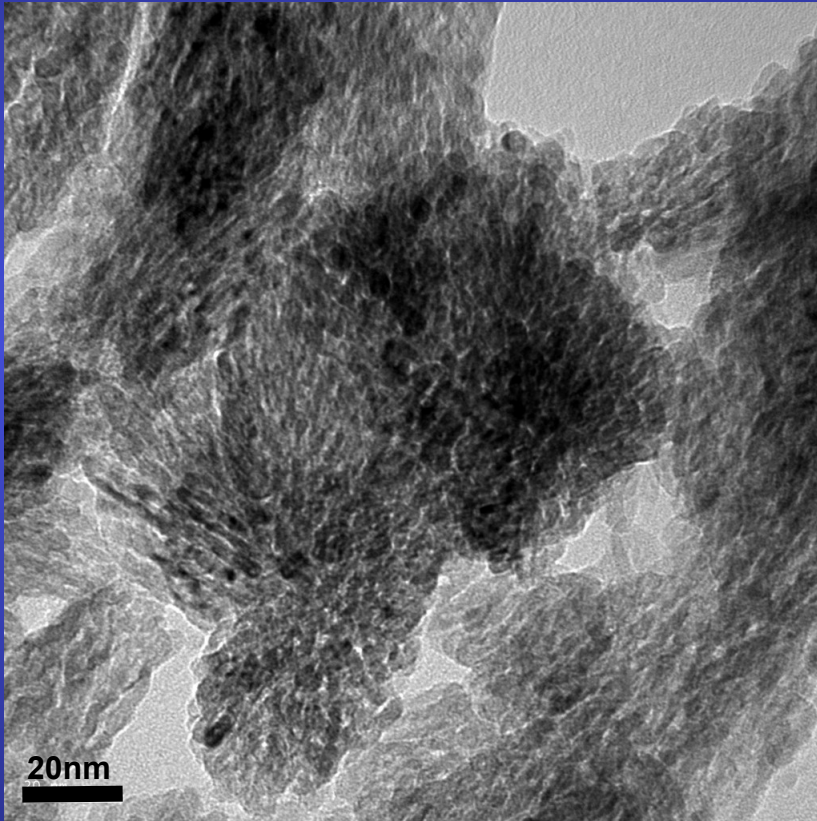
35 nm



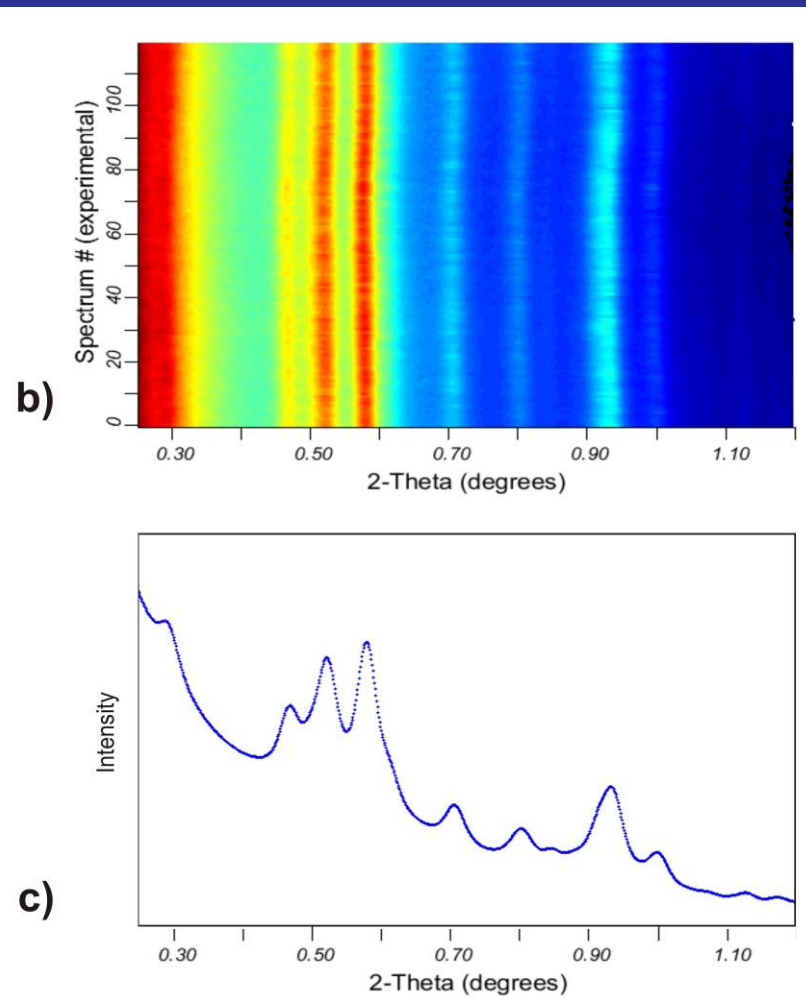
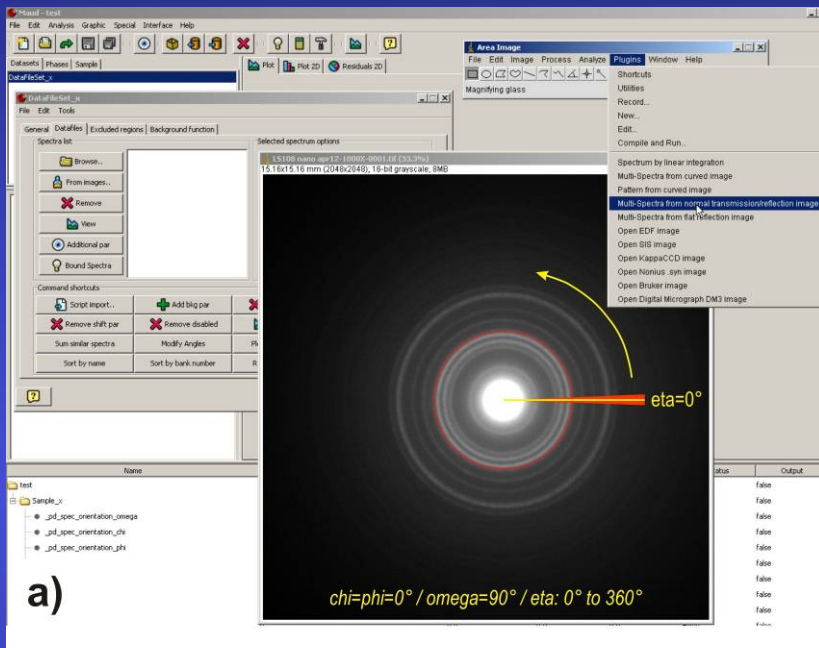
40 nm

Microstructure of nanocrystalline materials: TiO_2 rutile

- ▶ *quantitative analysis of electron powder diffraction (ring) pattern ?*

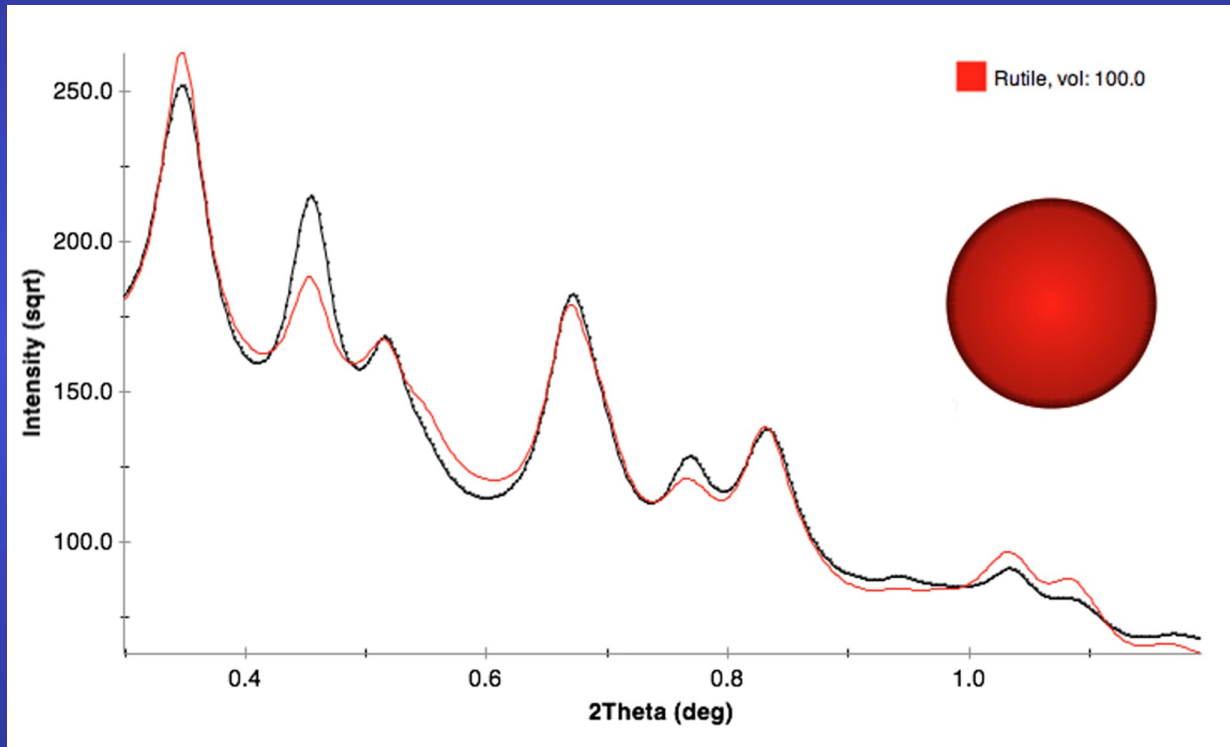


Intensity-spectra extraction



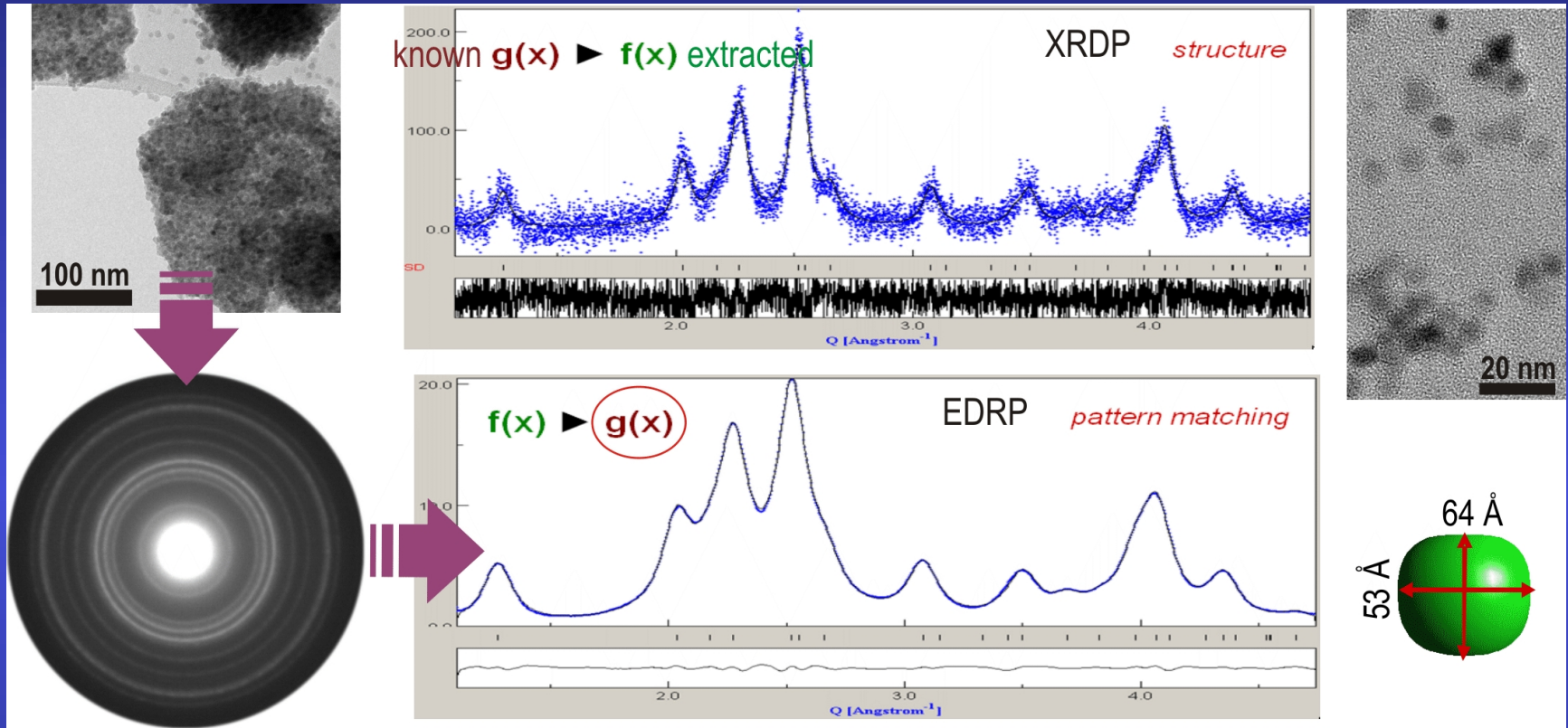
Full-Pattern Search-Match

www.iutcaen.unicaen.fr



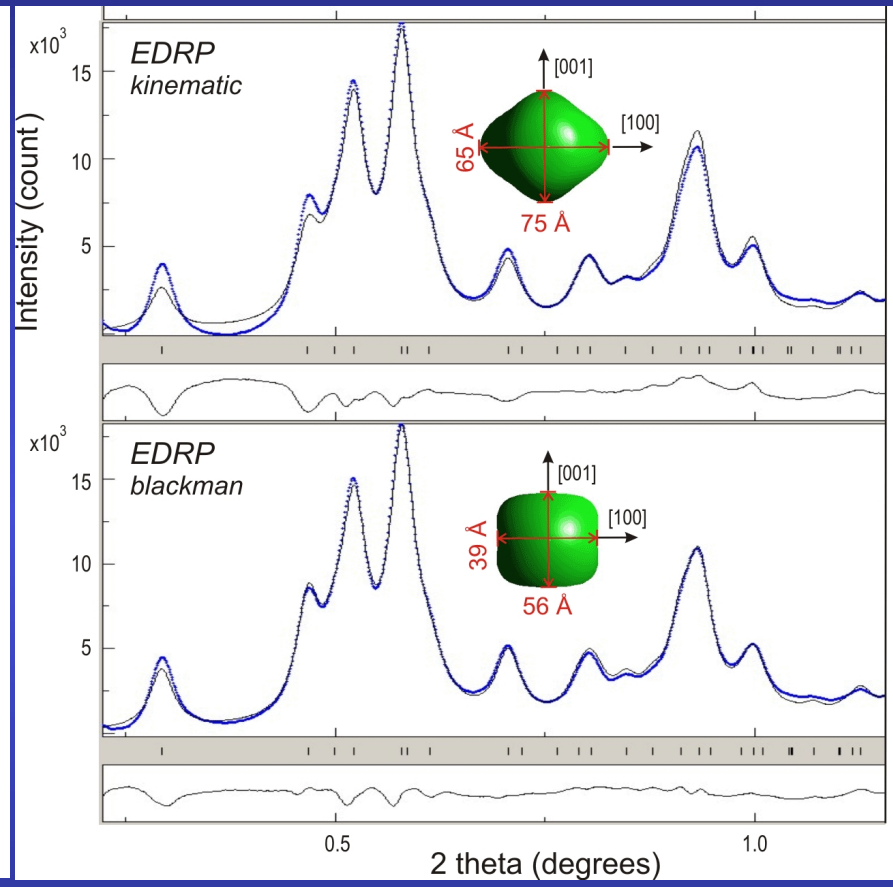
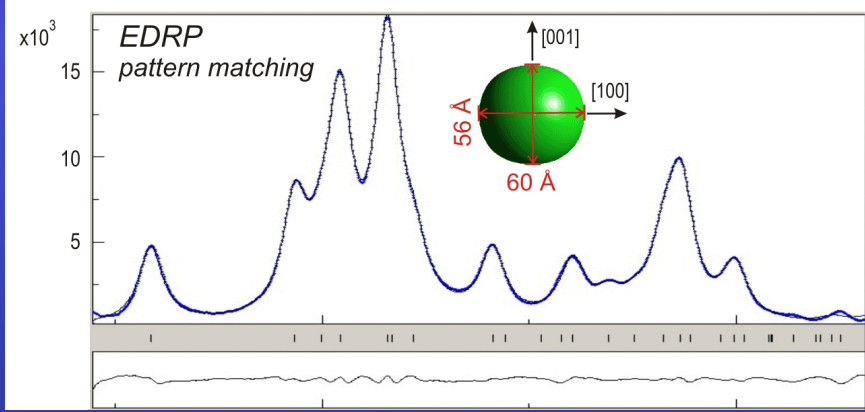
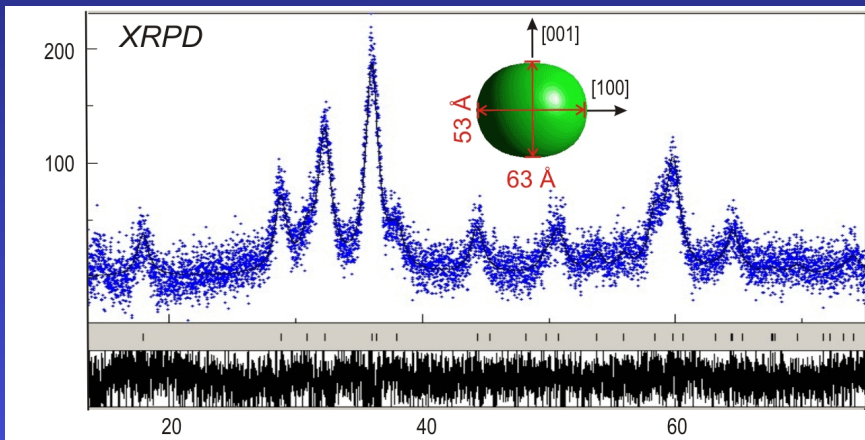
Rutile nanocrystalline Electron Powder Diffraction pattern

Reflection for 3h (100mg)

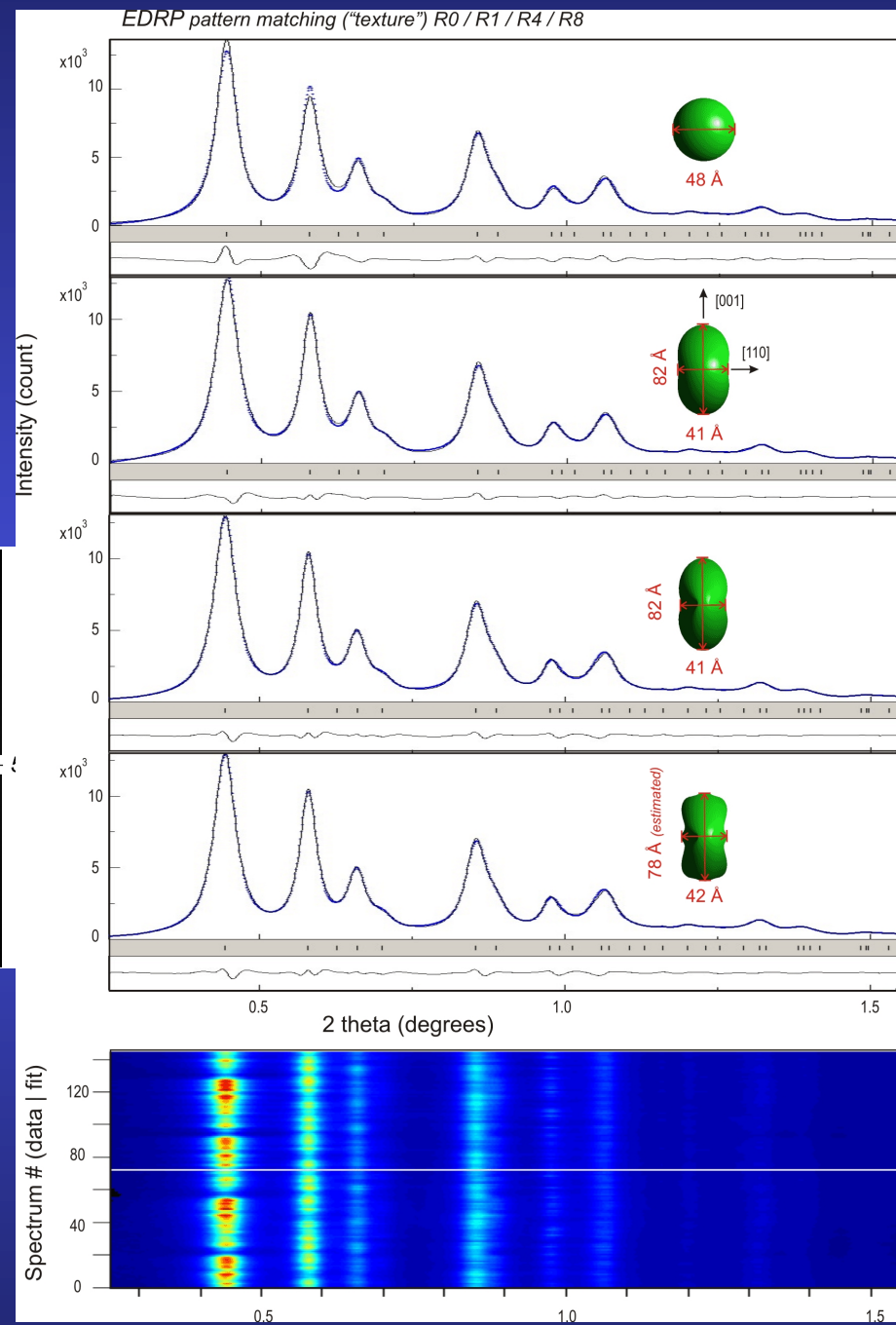
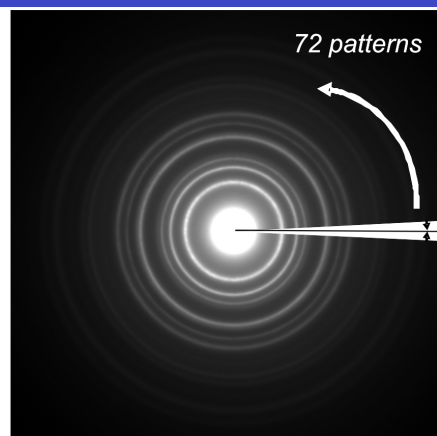
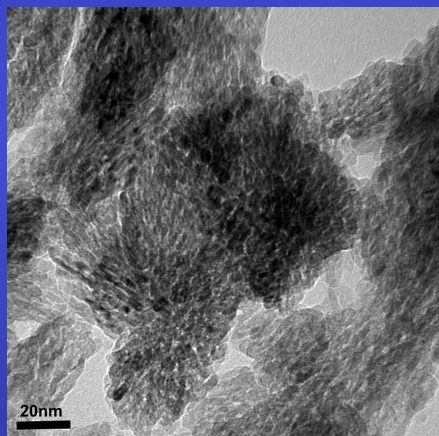


TEM in seconds (few μg)

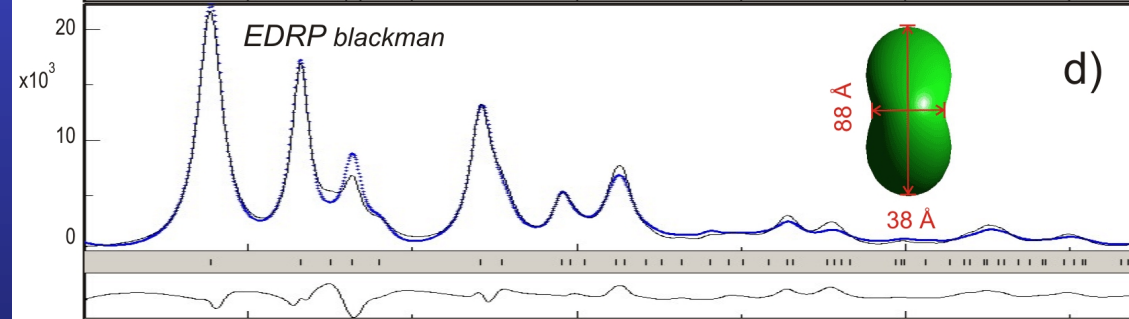
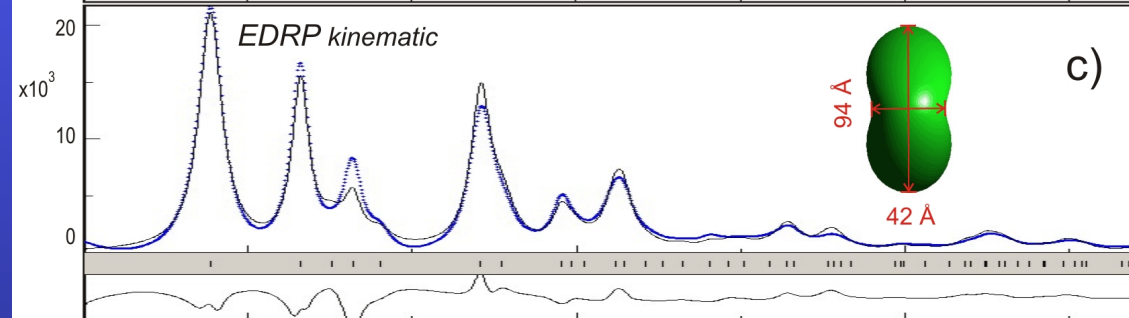
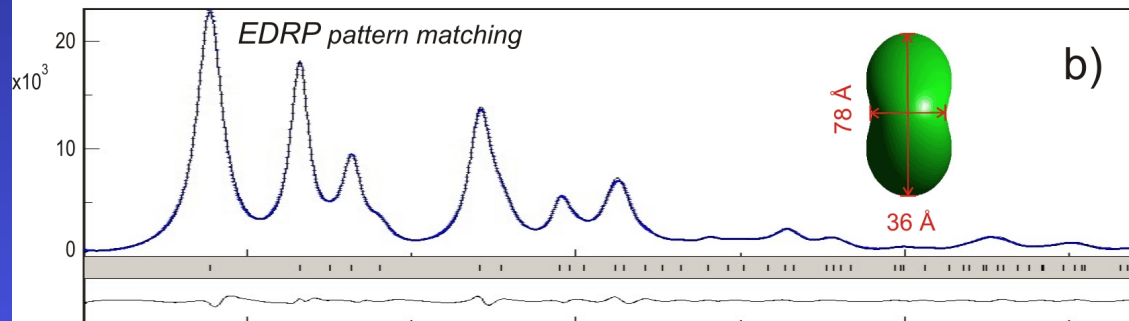
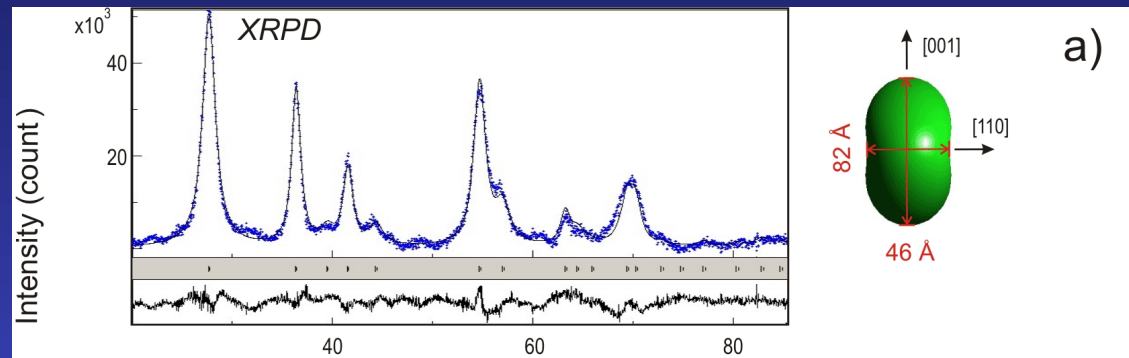
$$\langle R_h \rangle = R_0 + R_1 P_2^0(x) + R_2 P_2^1(x) \cos\varphi + R_3 P_2^1(x) \sin\varphi + R_4 P_2^2(x) \cos 2\varphi + R_5 P_2^2(x) \sin 2\varphi + \dots$$



TiO₂ nanopowders

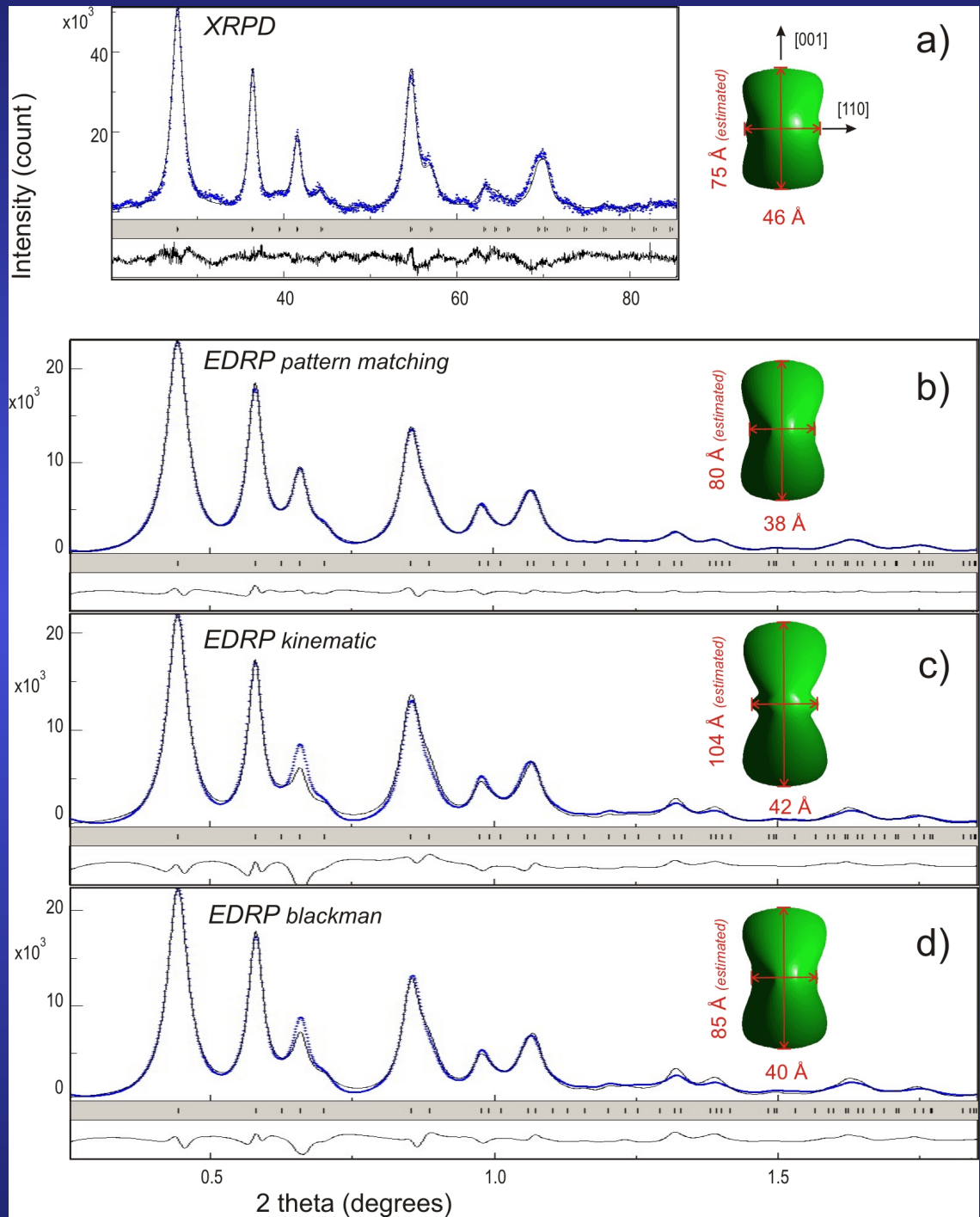


Popa $R_0 + R_1$



2 theta (degrees)

Popa up to R_4



Why not more ?

