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Advanced Tools for electron diffraction

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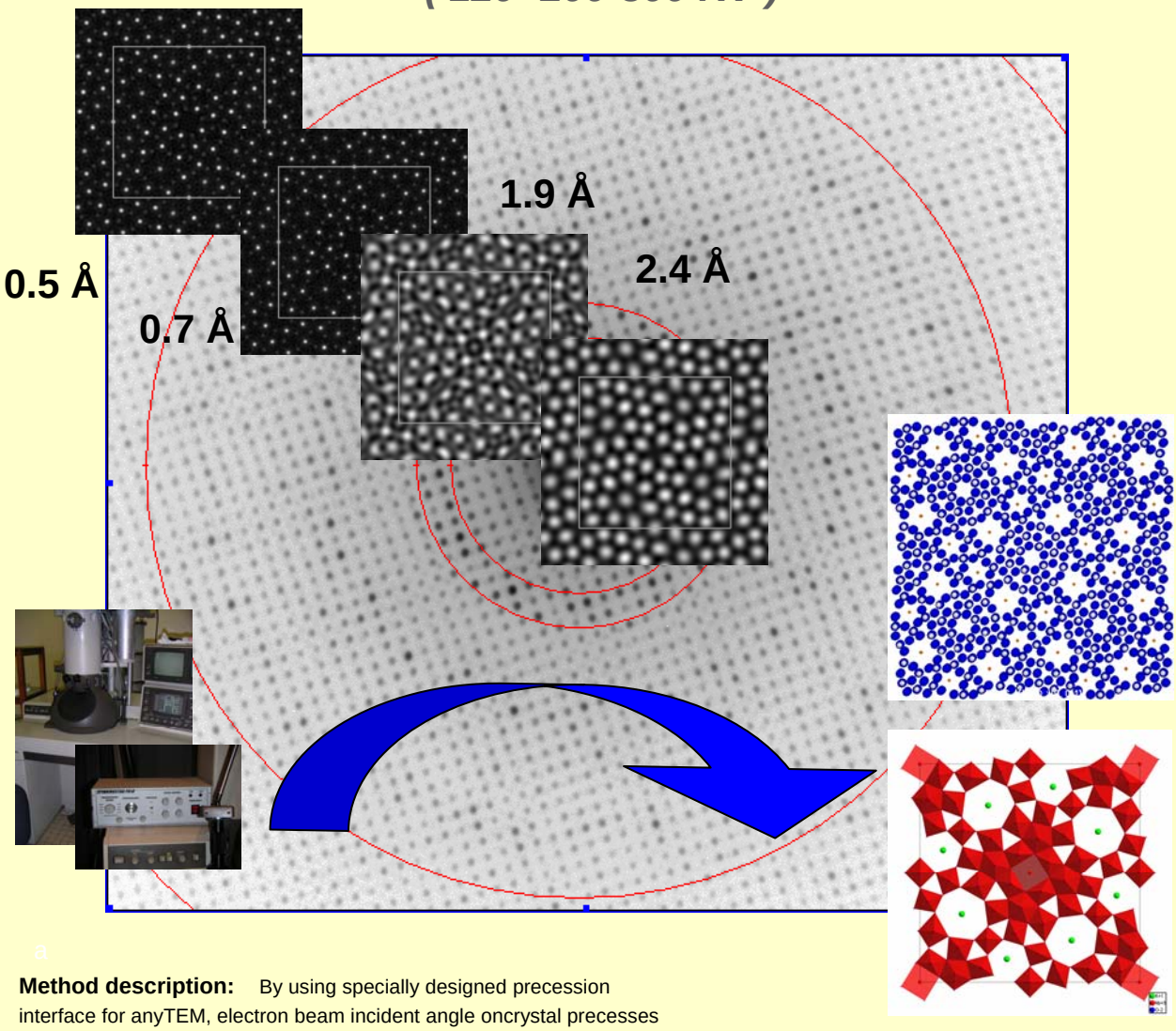
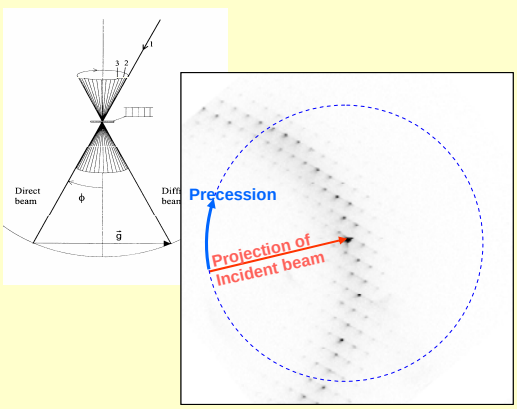
Get ultimate structure resolution (<1 Å) with your actual TEM (120 -200-300 KV)



Method description: By using specially designed precession interface for anyTEM, electron beam incident angle oncrystal precesses on cone with semiangle ϕ about zone axis orientation; In a conventional ED pattern many beams are simultaneously excited, leading to strong dynamical scattering. However, when the same beam is precessed on sequential excitation of reflections dynamical effects are weak.

Using the precession technique in TEM first developed by Vincent, Midgley(ref.1) a collection of quasi-kinematical 2D or 3D electron diffraction intensities can be obtained up to 0.5 **Å** resolution; crystal structure of any nanocrystal can be resolved then ab ibitio with same resolution like in single crystal X- ray crystallography.



Application example:

Complex oxide structure KNb7O18 with tetragonal structure P4/mbm a=b= 27.5 Å c= 3.94 Å (ref.2,3) has a peculiar structure with 7 sided tunnels of Nb atoms along (001). True structural details are impossible to observe with conventional HREM, as real details become visible only at about 1 Å resolution (see simulated HREM at given resolution).

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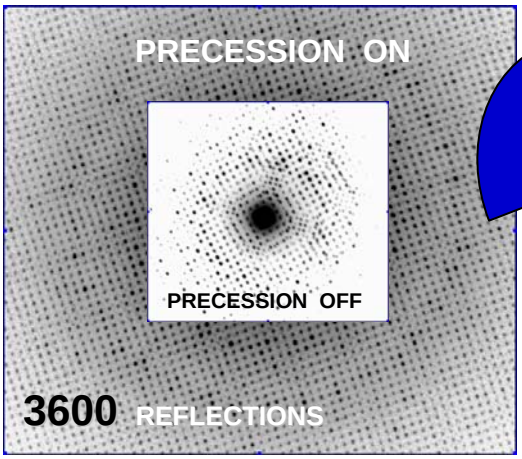
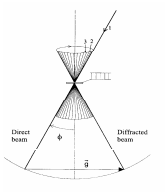
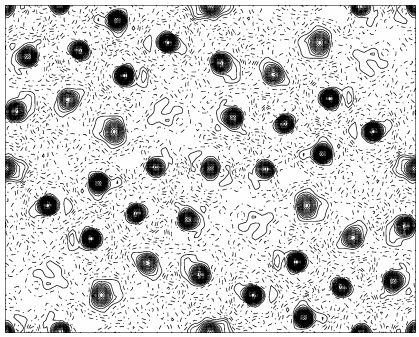
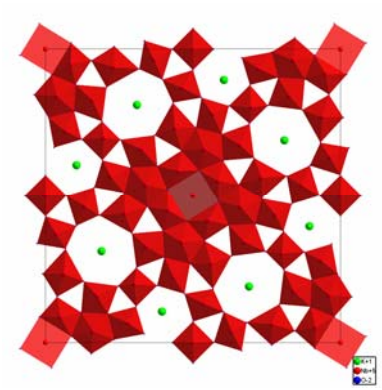
FROM DIFFRACTION PATTERN TO 2D STRUCTURAL MAP AT ONE STEP









By using special precession device fitted in a 200KV TEM precession ED pattern resolution extends dramatically up to 0.5 **Å**; by measuring precisely quasi-kinematical ED intensities (electron diffractometry) and using ab –initio standard direct methods crystallographic software, complete 2D crystal structure with all heavy atoms appear in their correct positions.

PRECESSION TEM interfase SPINNING STAR

- **easily retrofit to any TEM 100-300 KV**
- **precession possible for any beam size 300 - 50 nm**
- **precession eliminates false spots due to dynamical contributions**
- **software ELD for automatic Intensity/symmetry measurement**

- **automatic 3D structure determination with electron diffractometer**

With electron diffractometry we can measure, collect and combine automatically quasi-kinematical precession electron diffraction intensities from different zone axis to one 3D data set , resolving ab-initio 3D structure from any nanocrystallite

References

1.Vincent & Midgley *Ultramicroscopy* **53** (1994) 271
2. Bhinde et al Acta Cryst B 35 (1979) , 1318-1321
3. Hu et al Ultramicroscopy (1992) 41,387- 397

Acknowledgements

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