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ELECTRON DIFFRACTION: COST COMPARISON

A dedicated electron diffractometer combines the best of two worlds. The perfect rotation from X-ray diffraction and the electron beam to access the sub µm-regime. The ease-of-use of ELDICO's instrumentation concept enables significantly higher efficiency in measurements: 1,600 samples per year (factor of 4 higher than on X-ray diffractometers) and a cost per sample of roughly EUR 170 (up to 69% lower compared to TEM) are strong arguments in favor of the acquisition of a proper electron diffraction device.

Our detailed cost comparison shows the unbeatable financial advantages of a dedicated electron diffractometer over traditional X-ray or 'retroffited' (TEM)-based approaches.

Time per measurement
1 hour

Measurements per year
4 x more[1]

Cost per measured sample
171€

Cost savings per sample
up to 69%[2]

THE BEST OF TWO WORLDS

The combination of proven technological principles and components from X-ray crystallography and electron microscope technology can effectively support crystallographers' need for perfect data also in the yet unaccessible sub-µm regime. The well-known bottleneck of having to grow crystals to the required size is no longer an issue.

	X-ray diffractometer	TEM	ELDICO SCIENTIFIC
Nano-sized samples	Physical barrier; no access to the sub-µm range	✓	✓
Direct method; omits the need for preparative chemistry to grow large crystals	Major bottleneck: crystal size[3]	✓	✓
Exclusive access to instrumentation for the crystallographer	✓	RESTRICTED[4]	✓
Diffraction mode: 'Continuous rotation'	✓	INADEQUATE	✓
Compact instrumentation	✓	SPECIAL REQUIREMENTS[5]	✓

[1] Compared to X-ray.
[2] Compared to TEM.
[3] Large enough crystals may be not obtained at all.
[4] Competitive with imaging applications; cannot be used without operator.
[5] Special spatial and equipment requirements, such as ceiling height and floor carrying capacity.

COST PER MEASUREMENT[1]

	X-ray diffractometer	TEM	ELDICO SCIENTIFIC
Time per measurement[2]	4 hours	2 hours	**1 hour**
Measurements (per year)[3]	400	800	**1,600**
Cost per measured sample	€ 423	€ 548	**€ 171**
Savings per measured sample in EUR[4]	€ 252	€ 377	-
Savings per measured sample in %	58%	69%	-
Potential annual savings in EUR[5]	€ 101,000	€ 302,000	-

[1] Instrumentation and staff; example: overhead indirect cost assumed similar for all categories.
[2] Typical time, including preparative sample mounting, evaluation and picking.
[3] 200 days of operation per year.
[4] Based on number of measurements; full instrumentation capacity utilized exclusively for crystallographic applications.
[5] Compared to dedicated electron diffraction with an ELDICO electron diffractometer.

INVESTMENT AND TOTAL COST OF OPERATION

All amounts in EUR	X-ray diffractometer	TEM	ELDICO SCIENTIFIC
a.) Investment			
Initial investment in hardware	300,000 – 1,000,000	1,200,000[1]	1,800,000
Set- up & calibration[2]	n/a	200,000[3]	n/a
Depreciation (10% p.a.)[4]	30,000 – 100,000	140,000	180,000
b.) Operating cost p.a.			
Maintenance (4%)	up to 40,000	> 60,000	20,000 – 40,000
Additional staff[5]	n/a	100,000	n/a
c.) Consumables	2,000 – 3,000	3,000 – 5,000	2,000 – 3,000
d.) Updates			
Hardware (1–3 years)	8,000 – 50,000[6]	50,000 – 300,000	10,000 – 100,000
Software (3–5 years)	5,000	20,000 – 30,000	5,000
Est. total cost of operation p.a.	**169,000**	**439,000**	**274,000**

[1] Lower average price assumption; investments in TEM hardware vary from EUR 0,5 M – +10 M.
[2] TEM requires heavy modifications and additional engineering to enable diffraction mode.
[3] Additional effort needed, such as for add-ons (hardware, software) plus 2 to 3 month of 1 FTE for mechanical calibration to ED requirements.
[4] Comparisons are based on the assumption of a 10-year operating period and linear depreciation.
[5] Additional staff; one additional TEM operator at EUR 100k annual salary needed.
[6] Component replacements such as slits, capillary, detector, source, etc.

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