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Best Sample	k*10 ⁻³ (1/min)	Productivity (g/Day)	1/costs (g /k€)	hourly production rate (mg/h)
Φ-ΝΤΟ	13,08	0,25	1,01	21
X-NO	10,83	34,33	151,20	1925
X-NR*	22,36	15,50	68,41	873
Xhv-NTO*	5,82	13,10	46,02	481





For one Batch	Labor	Depreciation	Facilities	chemicals, energy, consumables	For one Batch	Labor	Depreciation	Facilities	chemicals, energy, consumables
Φ-ΝΤΟ	450,84€	564,36€	872,73€	84,48 €	Φ-ΝΤΟ	23	29	44	4
X-NO	84,94 €	181,37€	327,27€	87,63€	X-NO	12	27	48	13
X-NR*	84,94 €	94,89€	218,18€	55,12€	X-NR*	19	21	48	12
Xhv-NTO*	124,14€	98,76€	218,18€	128,29€	Xhv-NTO*	22	17	38	23

				chemicals,	
For one gram	Labor	Depreciation	Facilities	energy,	Total
				consumable	
Φ-ΝΤΟ	225,42€	282,18€	436,36€	42,24 €	986,21€
X-NO	0,82€	1,76€	3,18€	0,85€	6,61€
X-NR*	2,74€	3,06€	7,04 €	1,78€	14,62€
Xhv-NTO*	4,74€	3,77€	8,33€	4,90 €	21,73€

The following table is a tool developped to assess the production costs of one production batch of nanoparticles, and then infer the production costs for 1g of dried nanoparticles	technicians	s of a qualified including taxes hours]	26,14€	taxes for a Fre	ualy) including ench qualified edian value [€]	42000	Legal working time per years [hours]	1607	methods, we	of comparing the different will use the same hourly the synthesis (i.e. french values)
The time duration to produce one batch is an important parameter since it will defined the manpower costs, as well as equipment depreciation. We assume 5 year for the depreciation of the investments (standard value)	C .	ost (France, VAT d) [€ / kWh]	0,12€							
In the following table, the time duration is divided in two parts: (i) the working time of a technicien (Manpower) and (ii) the equipment operating times. The manpower is used to compute the salary cost, the equipment operating times is used to	r years (for [h	hine time on 5 depreciation) ours]	8800	Deprecisation period [year]	5	Working weeks in a year	44		me per week ours]	40
compute the depreciation of the investments (equipments) and the electricity cost: Moreover, an immobilisation of the equipment is used to compute the rental cost of the facilities	f									
Rental of facilities: 30 m ² of experimental room including a fume hood, an office o 10 m ² , the rental expenses (processing of the chemical waste, fluids consumption, cleaning and security, air conditionning).	Rental cost p	oer working day /day]	109,09€	Facilities rental [€/years]	24000	-	ys in a year = eeks x 5 Days	220		
Pulsed Laser Ablation In Liquids			Con	nments						
Productivity, i.e. weight in grams of dried powder produced in one batch	[g/batch]									
Volume of purified water (18MΩ) used to produce one batch 20,4	[L]			d with a purificat		Purification co	ost [€/L]	0,308813788	l	
Immobilisation of the equipments for one batch 8	[Days]		nd purification	itical step is the a can be performe ner batch.						
Product costs for one batch (chemicals) 10,64 €	[€] VAT	CeO2 powders	99,99% (3 targ	gets, 3 g/target, 5	91€/500g)					
Consumable (chemicals excluded) 25,00 €	excluded	Fluidic system (tubes) ~ 25€						
Time duration: Manpower (time spent by an researcher/technician) and machine time are separated. As an exemple, for PLAL, the target preparation involves 1H of work for the pellet preparation, even if the time duration of the annealing is 24H	Equipment operating times [Hours]	Power consumption of the machines [W]	Electricity costs per batch [€] VAT excluded	Investment Cost of the equipments [€] VAT excluded	Equipments depreciation for one batch [€] VAT excluded			Com	ments	
Synthesis preparation	1 24	4500	13,05€	16000	43,64€	Target prepar			E) computer, drivi	20
Synthesis (main process involving "expensive" setup or apparatus)	.2 68	3000	24,65€	65000	502,27€		s+peristaltic pu			ng
	4 16 5 10		3,63€			Rotovap (Bath			Chiller 650W)	
·····	.5 10		1,21 € 42,54 €		2,27 € 564,36 €	drying (Oven	1000w), one n	ignt		
Labor: 450,84	€	Electricity:	42,34 €							
		•	VAT excluded	•	VAT excluded					
Labor: 450,84 Total chemicals, energy, consumables 84,48 Rental cost of the facilities 872,73	€	•		•	VAT excluded					
Total chemicals, energy, consumables 84,48 Rental cost of the facilities 872,73	€	·	VAT excluded	•						
Total chemicals, energy, consumables 84,48 Rental cost of the facilities 872,73 Production cost per gram, VAT excluded 986,21 € \$1 084,83 Not	€	for target prepa	VAT excluded	nal), R&D, qualit						

Info Water purification (18MΩ)	Price, one Kit	Volume produced, one kit [L]	Volume used for on batch	Costs
PREtreatment SMART2PURE Kit	293,91	1800	20,4	3,33098
ULTRA PURE Water KIT	372,69	4000	20,4	1,900719
flow rate (L/H)	for one batch [L]	Production time [H]	Smart2Pure System	Depreciation
Smart2Pure system (6L/H)	6 20,4	3,4	2764,5	1,068102273
		Total cost wat	er	6,299801273

The following table is a tool developped to assess the production costs of production batch of nanoparticles, and then infer the production costs fo dried nanoparticles		, technicians i	of a qualified ncluding taxes ours]	26,14€	Wage bill (Ann taxes for a Fre technician, me	•	Legal 42000 working time per years [hours]	1607	For the sake of comparing the d methods, we will use the same costs for all the synthesis (i.e. t values)	e hourly
The time duration to produce one batch is an important parameter since defined the manpower costs, as well as equipment depreciation. We assume for the depreciation of the investments (standard value)			st (France, VAT) [€ / kWh]	0,12€						
In the following table, the time duration is divided in two parts: (i) the work of a technicien (Manpower) and (ii) the equipment operating times. The ma is used to compute the salary cost, the equipment operating times is use compute the depreciation of the investments (equipments) and the electrici Moreover, an immobilisation of the equipment is used to compute the renta	anpower ed to ity costs.	years (for c	nine time on 5 lepreciation) purs]	8800	Deprecisation period [year]	5	Working weeks in a 44 year		ne per week 40 burs]	
the facilities Rental of facilities: 30 m ² of experimental room including a fume hood, an 10 m ² , the rental expenses (processing of the chemical waste, fluids consur cleaning and security, air conditionning).	office of		er working day day]	109,09€	Facilities rental [€/years]	24000	Working days in a year = Working Weeks x 5 Days	220		
Photochemistry				Cor	nments					
Productivity, i.e. weight in grams of dried powder produced in one batch	26,2	[g/batch]								
Volume of purified water $(18M\Omega)$ used to produce one batch	80	[L]	18MΩ v	vater produce	d with a purificat	ion units	Purification cost [€/L]	0,308813788	I	
Immobilisation of the equipments for one batch	2	[Days]	Pilot plant sy	nthesis and w	hashing time of t	he pilot plant				
· · · · · · ·	00,27 € 1.20 €	[€] VAT excluded	173.68 g of ceri ammonium for		xahydrate + 504.	48 g of				
Time duration: Manpower (time spent by an researcher/technician) and machine time are separated. As an exemple, for PLAL, the target Ma	inpower Hours]	Equipment operating times [Hours]	Power consumption of the machines [W]	Electricity costs per batch [€] VAT excluded	Investment Cost of the equipments [€] VAT excluded	Equipments depreciation for one batch [€] VAT excluded		Comi	ments	
Synthesis preparation	0,5	0,5	40		248,5	0,01€				
Synthesis (main process involving "expensive" setup or apparatus)	2	26	2732	-,	30000	,	Photochemical plant purcha	se and installa	tion cost	
Post-treatment and purification Post-treatment and purification Labor:	2 0,25 124,14 €	2 10	Electricity:	1,21€	Depreciation:	0,56 € 2,27 € 91,48 € VAT excluded	drying (Oven 1000W), one n	ight		
	126,12 € 218,18 €									
Production cost per gram, VAT excluded 21,37 € \$23,51	Not inclu	uded: press fo	r target prepara	ation (Margina	al), R&D, quality	control				
Post-annealing Production cost per gram, including post- annealing VAT excluded 21,73 € \$23,90	0	4	4500	2,18€	16000	7,27€	-			

The following table is a tool developped to assess the production costs of one production batch of nanoparticles, and then infer the production costs for 1g or dried nanoparticles	technicians	s of a qualified including taxes hours]	26,14€	taxes for a Fre	ualy) including ench qualified edian value [€]	Legal 42000 vorking tin per years [hours]	ne 1607	For the sake of comparing the different methods, we will use the same hourly costs for all the synthesis (i.e. french values)
The time duration to produce one batch is an important parameter since it wil defined the manpower costs, as well as equipment depreciation. We assume 5 ye for the depreciation of the investments (standard value)	rc	ost (France, VAT d) [€ / kWh]	0,12€					
In the following table, the time duration is divided in two parts: (i) the working ti of a technicien (Manpower) and (ii) the equipment operating times. The manpow is used to compute the salary cost, the equipment operating times is used to compute the depreciation of the investments (equipments) and the electricity co	r years (for [h	hine time on 5 depreciation) ours]	8800	Deprecisation period [year]	5	Working weeks in a 44 year		me per week 40 burs]
Moreover, an immobilisation of the equipment is used to compute the rental cos the facilities								
Rental of facilities: 30 m ² of experimental room including a fume hood, an office 10 m ² , the rental expenses (processing of the chemical waste, fluids consumption cleaning and security, air conditionning).	Rental cost	oer working day /day]	109,09€	Facilities rental [€/years]	24000	Working days in a year Working Weeks x 5 Day	220	
Hydrotermal - nanorods			Cor	nments				
Productivity, i.e. weight in grams of dried powder produced in one batch	[g/batch]							
Volume of purified water (18MΩ) used to produce one batch 7	[L]					Purification cost [€/L]	0,308813788	3
Immobilisation of the equipments for one batch 2	[Days]	Autoclave:		ation + warming/ 12h@100°C)	cooling time			
Product costs for one batch (chemicals) 46,20	[€] VAT	Ce(NO3)3.6H2C	D : 265€/1kg; N	NaOH: 286€/10kg	I			
Consumable (chemicals excluded) 0,00 €	excluded							
Time duration: Manpower (time spent by an researcher/technician) and machine time are separated. As an exemple, for PLAL, the target preparation involves 1H of work for the pellet preparation, even if the time duration of the annealing is 24H	Equipment r operating times [Hours]	Power consumption of the machines [W]	Electricity costs per batch [€] VAT excluded	Investment Cost of the equipments [€] VAT excluded	Equipments depreciation for one batch [€] VAT excluded		Com	ments
Synthesis preparation	1 1	20	0,00€	1070	0,12€	E Balance (520€); stirrer (2	0W, 550€)	
Synthesis (main process involving "expensive" setup or apparatus)	,5 7		2,54€	37499	29,83€	Autoclave		
cooling of the autoclave Post-treatment and purification	0 12 ,5 1,5		0,00€ 0,83€	37499 25000		Autoclave Washing / centrifugation		
Post-treatment and purification	25 10) 1000	1,21€	2000	2,27 €	Drying		
Labor: 84,	€	Electricity:	4,58 € VAT excluded	-	87,62 € VAT excluded			
Total chemicals, energy, consumables 52,								
Rental cost of the facilities 218,	€							
Production cost per gram, VAT excluded 14,31 € \$15,74 Not	ncluded: press f	or target prepara	ation (Margina	al), R&D, quality	control			
Post-annealing	0 4	4500	2,18€	16000	7,27€			

The following table is a tool developped to assess the production costs of c production batch of nanoparticles, and then infer the production costs for 1 dried nanoparticles	of technicia	sts of a qualified is including taxes £/hours]	26,14€	taxes for a Fr	nualy) including ench qualified edian value [€]	42(00)	rking time years	1607	methods, w	e of comparing the different ve will use the same hourly II the synthesis (i.e. french values)
The time duration to produce one batch is an important parameter since it v defined the manpower costs, as well as equipment depreciation. We assume 5 for the depreciation of the investments (standard value)	Electricity	cost (France, VAT ed) [€ / kWh]	0,12€							
In the following table, the time duration is divided in two parts: (i) the working of a technicien (Manpower) and (ii) the equipment operating times. The manp is used to compute the salary cost, the equipment operating times is used to compute the investment (arguing the investment) and the electricity.	wer years (fo	achine time on 5 or depreciation) [hours]	8800	Deprecisation period [year]	5	Working weeks in a year	44		ne per week ours]	40
compute the depreciation of the investments (equipments) and the electricity Moreover, an immobilisation of the equipment is used to compute the rental c the facilities										
Rental of facilities: 30 m ² of experimental room including a fume hood, an offi 10 m ² , the rental expenses (processing of the chemical waste, fluids consump cleaning and security, air conditionning).	Rental cos	t per working day [€/day]	109,09€	Facilities rental [€/years]	24000	Working days in Working Weeks		220		
Hydrotermal - nano-octahedra			Coi	nments						
Productivity, i.e. weight in grams of dried powder produced in one batch	[g/batch									
Volume of purified water (18MΩ) used to produce one batch 7	[L]					Purification cost [€	€/L]	0,308813788		
Immobilisation of the equipments for one batch 3	[Days]	Autoclave:		ation + warming/ 15h@180°C)	cooling time					
Product costs for one batch (chemicals) 74,0			O : 265€/1kg; I	NH4OH : 33,9€/2,	,5L					
Product costs for one batch (chemicals) 74,0 Consumable (chemicals excluded) 0,00	evcluder			NH4OH : 33,9€/2,	,5L					
	€ excluded Equipment wer operation	t Power	Electricity costs per batch [€] VAT	NH4OH : 33,9€/2, Investment Cost of the equipments [€] VAT excluded	Equipments depreciation for one batch			Comr	ments	
Consumable (chemicals excluded) 0,00 Time duration: Manpower (time spent by an researcher/technician) and machine time are separated. As an exemple, for PLAL, the target preparation involves 1H of work for the pellet preparation, even if the [Hou	€ excluded Equipmen wer operatin rs] times	t Power consumption of the	Electricity costs per batch [€] VAT excluded	Investment Cost of the equipments [€] VAT excluded	Equipments depreciation for one batch [€] VAT excluded	Balance (520€); sti	irrer (20W,		ments	
Consumable (chemicals excluded) 0,00 Time duration: Manpower (time spent by an researcher/technician) and machine time are separated. As an exemple, for PLAL, the target preparation involves 1H of work for the pellet preparation, even if the time duration of the annealing is 24H	€ excluded wer operatin times [Hours] 1	t Power consumption of the machines [W]	Electricity costs per batch [€] VAT excluded 0,00 €	Investment Cost of the equipments [€] VAT excluded 1070	Equipments depreciation for one batch [€] VAT excluded 0,12 €	Balance (520€); sti Autoclave	irrer (20W,		ments	
Consumable (chemicals excluded)0,00Time duration: Manpower (time spent by an researcher/technician) and machine time are separated. As an exemple, for PLAL, the target preparation involves 1H of work for the pellet preparation, even if the time duration of the annealing is 24HManp (Hout Colling of the autoclaveSynthesis (main process involving "expensive" setup or apparatus) cooling of the autoclaveConsumable (chemicals excluded)	€ excluded wer Equipmer operatin times [Hours] 1 0,5 0	t Power consumption of the machines [W] 1 20 26 3000 15 0	Electricity costs per batch [€] VAT excluded 0,00 € 9,43 € 0,00 €	Investment Cost of the equipments [€] VAT excluded 1070 37499 37499	Equipments depreciation for one batch [€] VAT excluded 0,12 € 110,79 € 63,92 €	Autoclave Autoclave			ments	
Consumable (chemicals excluded)0,00Time duration: Manpower (time spent by an researcher/technician) and machine time are separated. As an exemple, for PLAL, the target preparation involves 1H of work for the pellet preparation, even if the time duration of the annealing is 24HManp (Hou (Hou Synthesis preparation Synthesis (main process involving "expensive" setup or apparatus)	€ excluded wer Equipmen operatin times [Hours] 1 0,5 0 1,5	t Power consumption of the machines [W] 1 20 26 3000	Electricity costs per batch [€] VAT excluded 0,00 € 9,43 € 0,00 € 0,83 €	Investment Cost of the equipments [€] VAT excluded 1070 37499 37499 25000	Equipments depreciation for one batch [€] VAT excluded 0,12 € 110,79 € 63,92 € 4,26 €	Autoclave			ments	
Consumable (chemicals excluded)0,00Time duration: Manpower (time spent by an researcher/technician) and machine time are separated. As an exemple, for PLAL, the target preparation involves 1H of work for the pellet preparation, even if the time duration of the annealing is 24HManp (Hou (Hou Synthesis preparationSynthesis preparation Synthesis (main process involving "expensive" setup or apparatus) cooling of the autoclave Post-treatment and purification Post-treatment and purification	€ excluded wer Equipmen operatin times [Hours] 1 0,5 0 1,5	t Power consumption of the machines [W] 1 20 26 3000 15 0 .,5 4600	Electricity costs per batch [€] VAT excluded 0,00 € 0,83 € 1,21 € 11,47 €	Investment Cost of the equipments [€] VAT excluded 1070 37499 37499 25000 2000 Depreciation:	Equipments depreciation for one batch (€) VAT excluded 0,12 € 110,79 € 63,92 € 4,26 € 2,27 € 181,37 €	Autoclave Autoclave Washing / centrifu Drying			ments	
Consumable (chemicals excluded)0,00Time duration: Manpower (time spent by an researcher/technician) and machine time are separated. As an exemple, for PLAL, the target preparation involves 1H of work for the pellet preparation, even if the time duration of the annealing is 24HManp (Hou (Hou Synthesis preparationSynthesis preparation Synthesis (main process involving "expensive" setup or apparatus) cooling of the autoclave Post-treatment and purification Post-treatment and purificationaddition Babor:Babor:8	€ excluded wer Equipmen operatin times [Hours] 1 0,5 0 1,5 0,25	t Power consumption of the machines [W] 1 20 26 3000 15 0 .,5 4600 10 1000	Electricity costs per batch [€] VAT excluded 0,00 € 9,43 € 0,83 € 1,21 €	Investment Cost of the equipments [€] VAT excluded 1070 37499 37499 25000 2000 Depreciation:	Equipments depreciation for one batch [€] VAT excluded 0,12 € 110,79 € 63,92 € 4,26 € 2,27 €	Autoclave Autoclave Washing / centrifu Drying			ments	
Consumable (chemicals excluded)0,00Time duration: Manpower (time spent by an researcher/technician) and machine time are separated. As an exemple, for PLAL, the target preparation involves 1H of work for the pellet preparation, even if the time duration of the annealing is 24HManp (Hou (Hou Synthesis preparationSynthesis preparation Synthesis (main process involving "expensive" setup or apparatus) cooling of the autoclave Post-treatment and purification Post-treatment and purificationapparatusLabor:8Total chemicals, energy, consumables8	€ excluded excluded peratin times [Hours] 1 0,5 0 1,5 0,25 ,94 €	t Power consumption of the machines [W] 1 20 26 3000 15 0 .,5 4600 10 1000	Electricity costs per batch [€] VAT excluded 0,00 € 0,83 € 1,21 € 11,47 €	Investment Cost of the equipments [€] VAT excluded 1070 37499 37499 25000 2000 Depreciation:	Equipments depreciation for one batch (€) VAT excluded 0,12 € 110,79 € 63,92 € 4,26 € 2,27 € 181,37 €	Autoclave Autoclave Washing / centrifu Drying			ments	
Consumable (chemicals excluded)0,00Time duration: Manpower (time spent by an researcher/technician) and machine time are separated. As an exemple, for PLAL, the target preparation involves 1H of work for the pellet preparation, even if the time duration of the annealing is 24HManp (Hou (Hou Synthesis preparation Synthesis (main process involving "expensive" setup or apparatus) cooling of the autoclave Post-treatment and purification Post-treatment and purificationapparatus apparatusTotal chemicals, energy, consumables Rental cost of the facilities8	€ excluded excluded peratin times [Hours] 1 0,5 0 1,5 0,25 ,94 € ,63 € ,27 €	t Power consumption of the machines [W] 1 20 26 3000 15 0 .,5 4600 10 1000	Electricity costs per batch [€] VAT excluded 0,00 € 9,43 € 0,00 € 0,83 € 1,21 € 11,47 € VAT excluded	Investment Cost of the equipments [€] VAT excluded 1070 37499 37499 25000 2000 Depreciation:	Equipments depreciation for one batch [€] VAT excluded 0,12 € 110,79 € 63,92 € 4,26 € 2,27 € 181,37 € VAT excluded	Autoclave Autoclave Washing / centrifu Drying			ments	
Consumable (chemicals excluded)0,00Time duration: Manpower (time spent by an researcher/technician) and machine time are separated. As an exemple, for PLAL, the target preparation involves 1H of work for the pellet preparation, even if the time duration of the annealing is 24HManp (Hou (Hou Synthesis preparation Synthesis (main process involving "expensive" setup or apparatus) cooling of the autoclave Post-treatment and purification Post-treatment and purificationapparatus apparatusTotal chemicals, energy, consumables Rental cost of the facilities8	€ excluded excluded peratin times [Hours] 1 0,5 0 1,5 0,25 ,94 € ,63 € ,27 €	t Power consumption of the machines [W] 1 20 26 3000 15 0 15 0 10 1000 Electricity:	Electricity costs per batch [€] VAT excluded 0,00 € 9,43 € 0,00 € 0,83 € 1,21 € 11,47 € VAT excluded	Investment Cost of the equipments [€] VAT excluded 1070 37499 25000 2000 Depreciation:	Equipments depreciation for one batch [€] VAT excluded 0,12 € 110,79 € 63,92 € 4,26 € 2,27 € 181,37 € VAT excluded	Autoclave Autoclave Washing / centrifu Drying			ments	