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從廢氫氟酸中回收氟元素 – 冰晶石技術
**Recovery of Fluorine from Waste Hydrofluoric
Acid as Cryolite**

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CONNECT

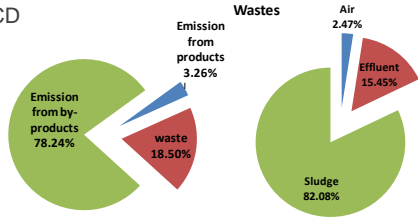
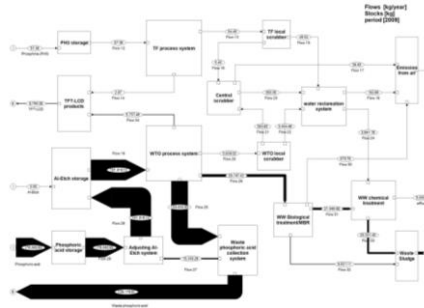


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Any Element is Resources

Phosphorus material flow in a case of TFT-LCD
(某TFT-LCD廠的磷物質流分佈)

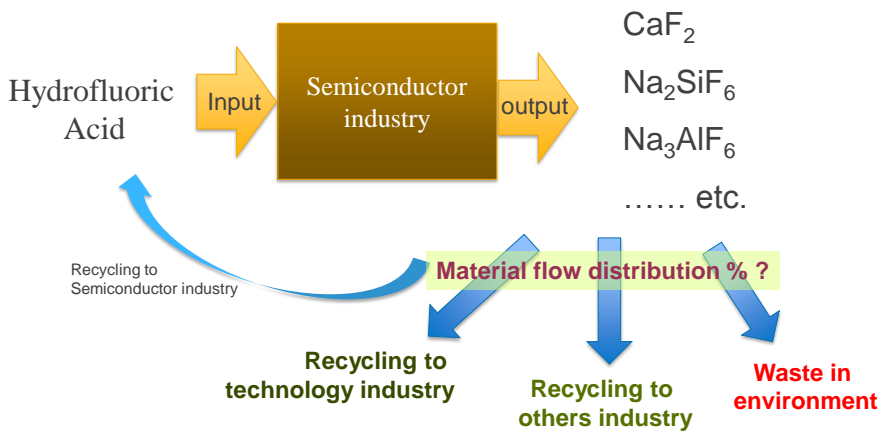


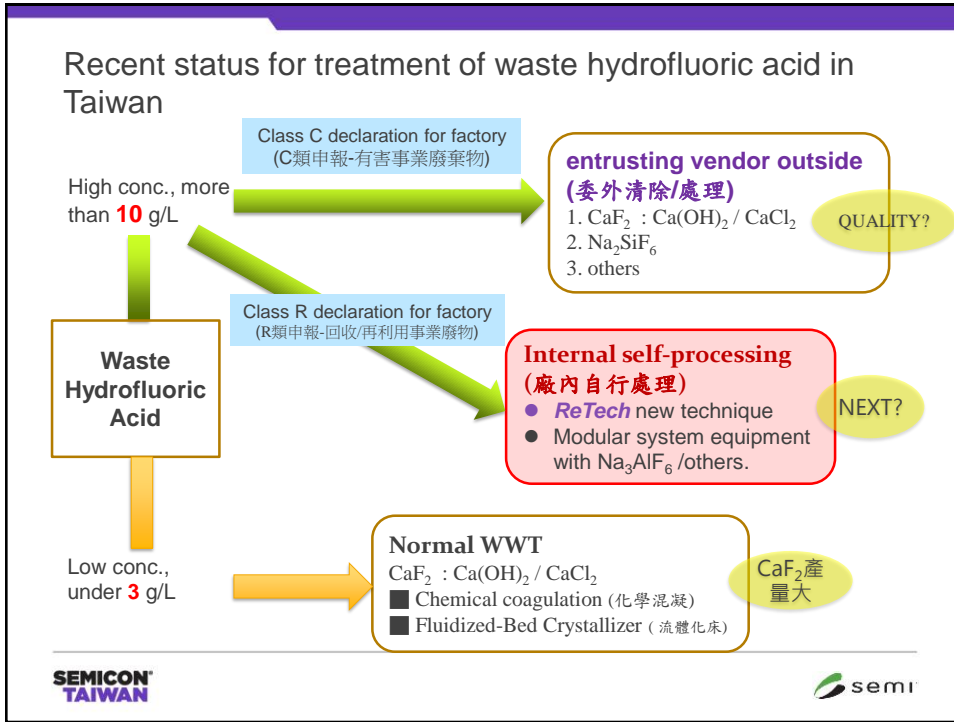
- Resource material is still regarded as the waste, and proportion %?
- Knowing type of wastes, find key point of the technology for resource recycling

Fluorine material flow of the semiconductor industry is still not clear



Waste Hydrofluoric Acid & Fluorine





Waste Hydrofluoric Acid & Cryolite

$$3\text{Na}^+ + \text{Al}^{3+} + 6\text{F}^- \rightarrow \text{Na}_3\text{AlF}_6 \text{ (Cryolite, 冰晶石, 氟鋁酸鈉)}$$

NaAlO_2 (from NaCl, NaOH) + $\text{Al}(\text{OH})_3$ (from Al_2O_3) + Waste HF

Cryolite standard, CHINA (GB/T 4291-2007)

牌号	化学成分(质量分数)/%								物理性能/ % 烧减量 (质量分数)	
	F	Al	Na	SiO_2	Fe_2O_3	SO_4^{2-}	CaO	P_2O_5		雜存水
	不小于			不大于						
CH-0	52	12	33	0.25	0.05	0.6	0.15	0.02	0.20	2.0
CH-1	52	12	33	0.36	0.08	1.0	0.20	0.03	0.40	2.5
CM-0	53	13	32	0.25	0.05	0.6	0.20	0.02	0.20	2.0
CM-1	53	13	32	0.36	0.08	1.0	0.6	0.03	0.40	2.5

注 1: 数值修约比较按 GB/T 1250 第 5.2 条规定进行, 修约数位与表中所列极限数位一致。
 注 2: 表中规定的各指标, 需方如有特殊要求, 可由供需双方协商解决。

Application of Na_3AlF_6
 Flux of electrolytic aluminum
 鋁電解製程的助熔劑
 Antiwear additive
 耐磨添加劑
 Flux of Steel industry
 鋼鐵業的熔劑

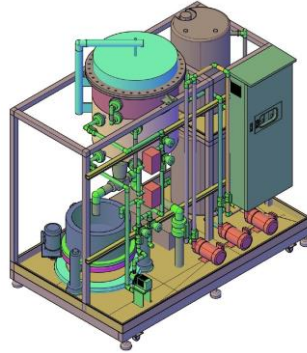
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A module system for treatment of waste HF on site –

ReTech (patent, US, TAIWAN, CHINA)

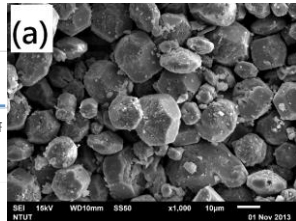
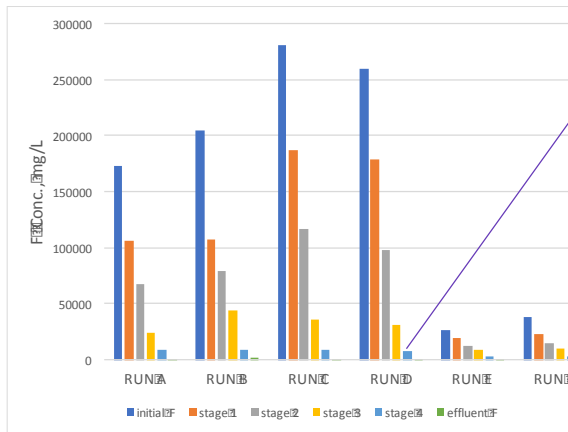


- Influent F conc. > 10,000 mg/L
- Effluent F < 3,000 mg/L
- F removal efficiency > 95%



Case study – a experience to treat high concentration waste HF as Cryolite on site by **ReTech**

Cryolite, Na_3AlF_6



Conclusion

- The materials of chemical element must be recovery to the suitable industry loop.
以化學元素的視角，讓物質循環到適合的產業迴圈裡
- Any concentration of waste HF can be reacted to a resource material in the factory, Class C declaration for factory will convert into Class R.
任何濃度的廢氫氟酸是可在廠內資源化的，使工廠可將原本的C類申報的有害事業廢棄物，轉成R類申報的可回收物質
- ReTech has developed a modular system with cryolite method to treat high concentrations of HF on site.
鋒霏環境科技已開發的模組化設備，搭配冰晶石法，已有在實廠將高濃度廢氫氟酸生產出冰晶石的案例
- Recovery waste HF as a resource material in factory and reduce entrusting vendor outside will be a new trend. Recent recovery industry need a new strategy for waste HF.

廢氫氟酸廠內資源化的新趨勢，將會讓我們資源回收業重新思考下一阶段應對廢氫氟酸資源化的策略