

[1-¹¹C]Sodium Acetate 放射藥物合成

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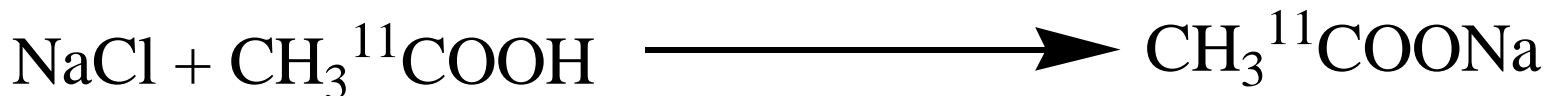
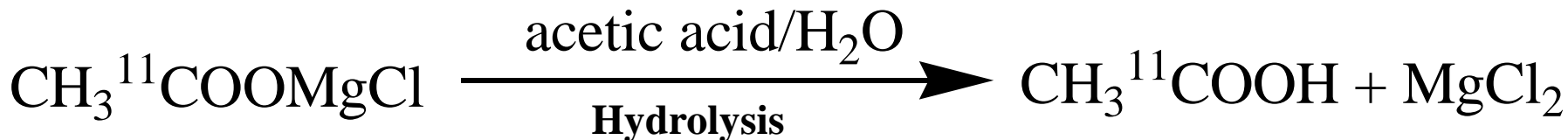
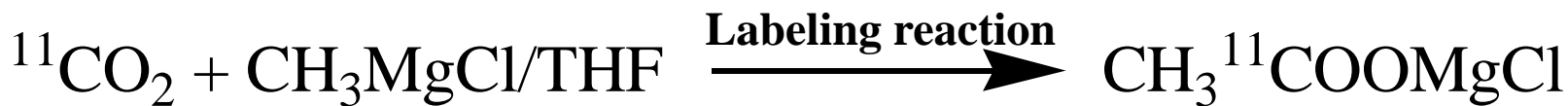
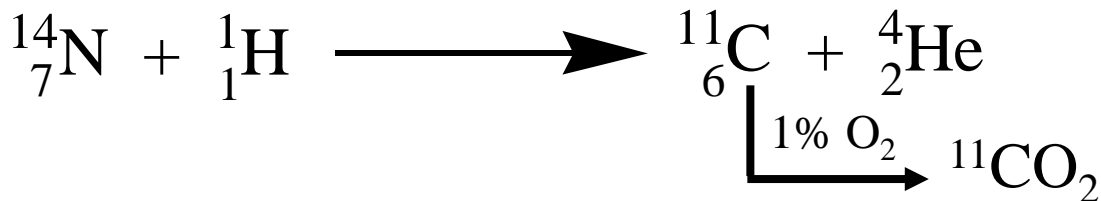
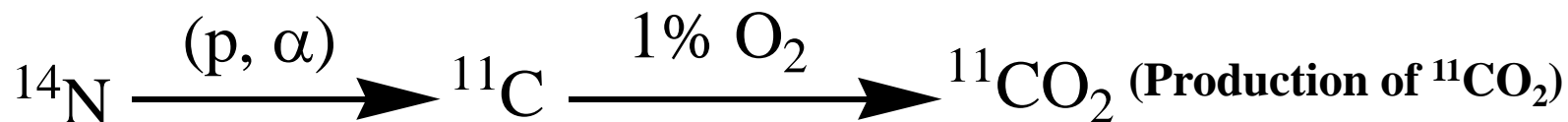
Physical properties of positron-emitting radioisotopes

Radio-nuclide	Half-life (min.)	Decay mode	Maximum energy (MeV)	Range mm (H₂O)
C-11	20.4	β^+ (99+%)	0.96	4.108
N-13	9.97	β^+ (99.9%)	1.19	5.39
O-15	2.04	β^+ (100%)	1.72	8.2
F-18	109.7	β^+ (97%)	0.635	2.39

Nuclear reactions of positron-emitting radioisotopes

Radio-nuclide	Target	Nuclear Reaction	Chemical form
C-11	$^{14}\text{N}_2 + 1\%\text{O}_2$	$^{14}\text{N} (p, \alpha) ^{11}\text{C}$	$^{11}\text{CO}_2$
N-13	$\text{H}_2^{16}\text{O} + \text{EtOH}$	$^{16}\text{O} (p, \alpha) ^{13}\text{N}$	$^{13}\text{NH}_3$
O-15	$^{14}\text{N}_2$	$^{14}\text{N} (d, n) ^{15}\text{O}$	$^{15}\text{O}_2$
F-18	H_2^{18}O	$^{18}\text{O} (p, n) ^{18}\text{F}$	H^{18}F
F-18	^{20}Ne	$^{20}\text{Ne} (d, \alpha) ^{18}\text{F}$	$^{18}\text{F}_2$

The Synthesis of [1-¹¹C]Sodium acetate



Purification of [1-¹¹C]Sodium Acetate

Chromafix PS-H⁺ and Chromafix PS-Ag⁺ cartridge

- Remove Magnesium and chloride ion

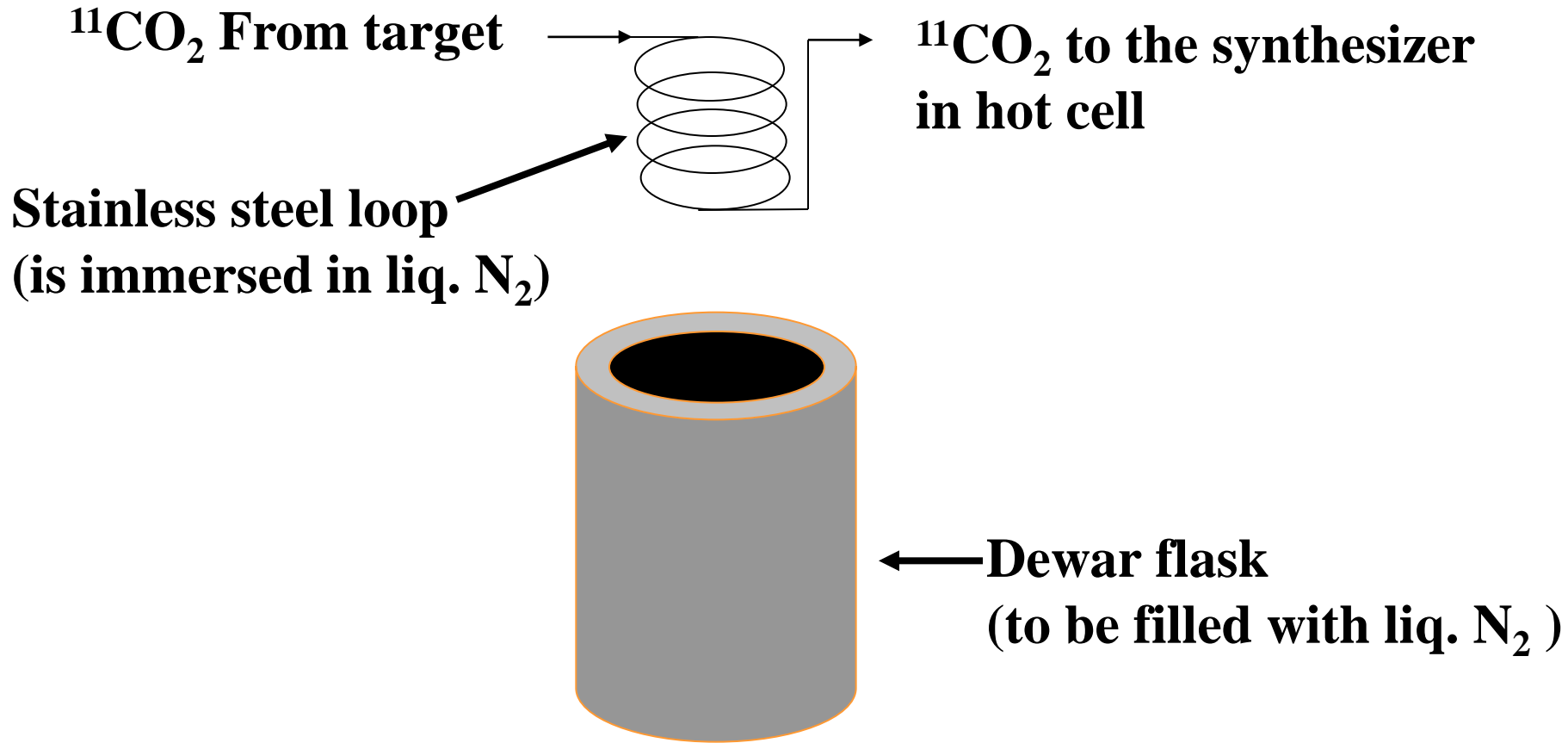
MaxiClean SAX cartridge

- Trap [1-¹¹C]sodium acetate

Sterilization of [1-¹¹C]Sodium Acetate

SLGSV255F 0.22μm 25mm sterile filter

Trapping of $^{11}\text{CO}_2$



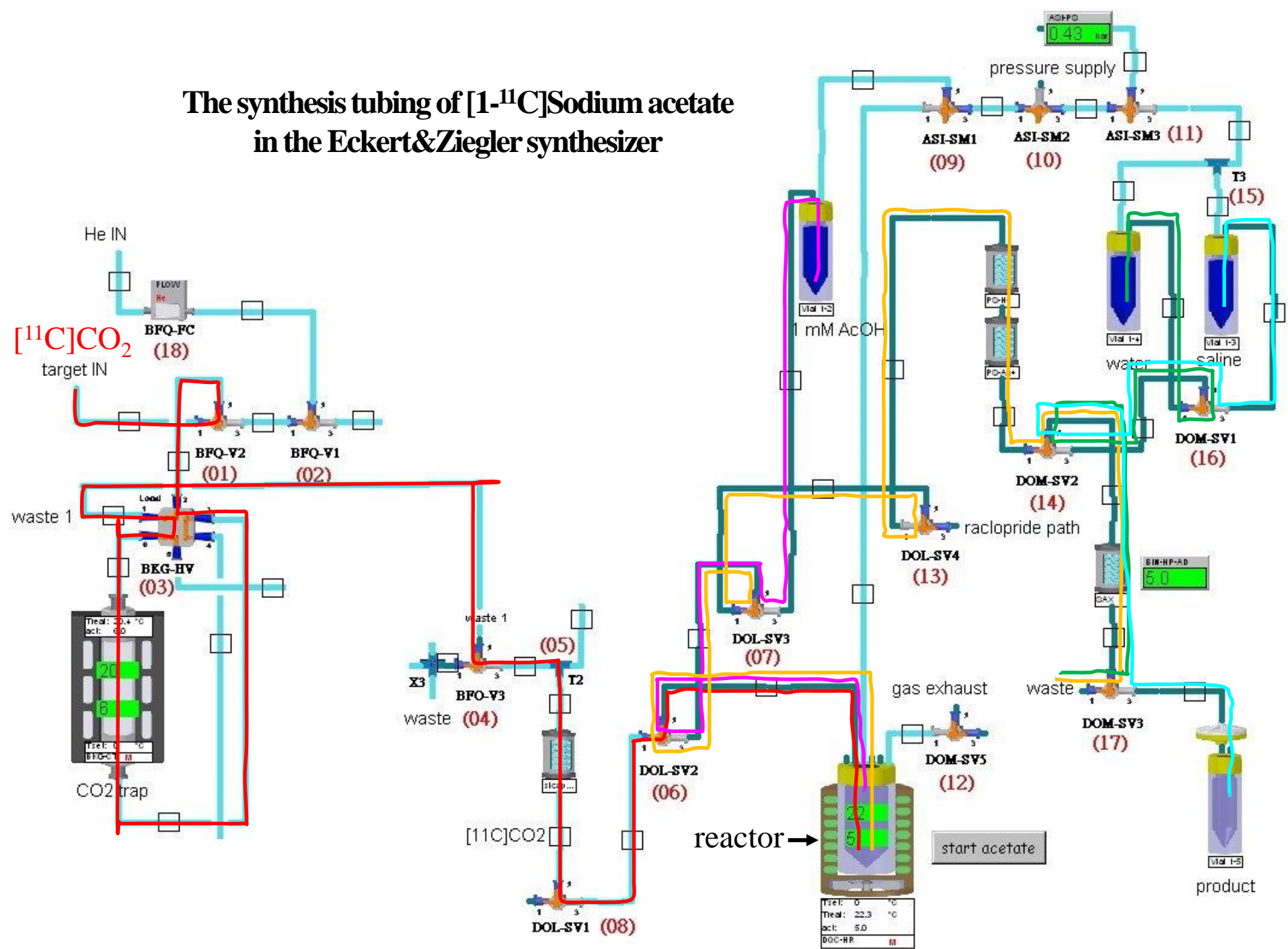
Liquid nitrogen in 1-L Dewar flask to trap $^{11}\text{CO}_2$

1-L Dewar flask →

Automated lift →



The synthesis tubing of [1-¹¹C]Sodium acetate in the Eckert&Ziegler synthesizer



Typical production data of [1-¹¹C]Sodium Acetate

Current integration(μ Ah): 50

Activity of ¹¹CO₂(mCi): ~2100

Activity of [1-¹¹C]sodium acetate(mCi): ~1100mCi

Total volume:~ 10 mL

Total synthesis time: 17 min

Radiochemical yield(%)(decay uncorrected): 50~55

Quality Control of [1-¹¹C]Sodium Acetate

Item of quality control	Criteria of EP 8.0	Typical Results
外觀	無色、澄清、無顆粒	無色、澄清、無顆粒
半衰期	19.9 ~ 20.9min	20.3min
pH值	4.5 ~ 8.5	7.5
放射核種鑑別	501 ~ 521 (keV)	509 keV
放射核種純度	>99%	99.8%
放射化學純度	≥ 95%	>99%
殘餘溶劑Ethanol含量	< 0.5%	0.07%
殘餘溶劑THF含量	< 0.072%	0.0048%
Sodium acetate含量	≤ 2mg/mL(≤ 20mg/V, V=10mL)	0.15mg/mL
內毒素試驗	< 175EU/V mL	< 5EU/mL
無菌性試驗	pass	pass
過濾膜完整性試驗	pass	pass

Useful ^{11}C -Labelled Synthons

