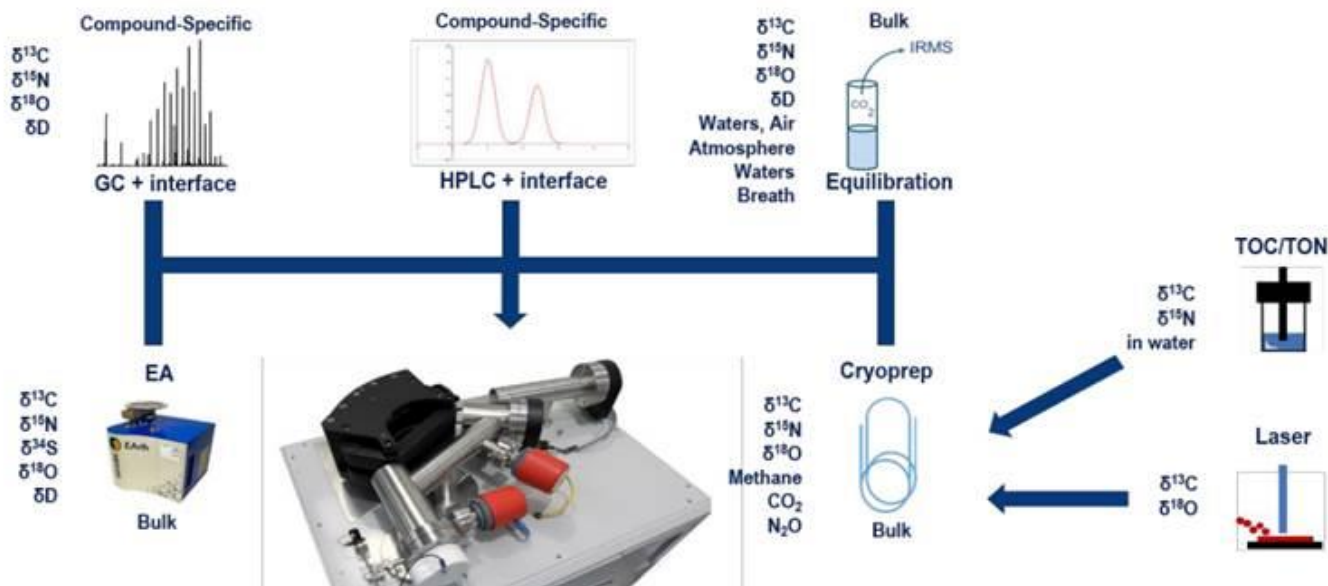


²H, ¹³C, ¹⁵N, ¹⁸O, ³⁴S 안정동위원소분석 소개

Iso-Analytical은 영국의 안정 동위 원소 비율 분석 (Stable Isotope Ratio Analysis, SIRA) 전문 연구실로, 경원소 안정동위체 (H, C, N, O, S)에 대한 정밀도 높은 분석 서비스를 제공하고 있습니다. 2000년에 설립되어 현재까지 약 5,000여개 연구를 진행해왔으며 약 300,000여개의 샘플을 분석해왔습니다.

- 농업 셀룰로오스, 식물 소재, 토양, 물
- 생태학 동물 조직, 뼈 콜라겐, 해양 필터, 물
- 식품신뢰성 향료 화합물, 과일 주스 성분, 꿀/시럽 성분
- 법의학 약물, 기록물, 폭발물, 섬유, 포장재
- 지구화학 탄산염, 석유, 황을 포함한 광물
- 약학 호흡 검사, 최종 산출물, DLW법에 의한 에너지소비, 신진대사, 총 체수분량 측정
- 표준 보정 (Standard)



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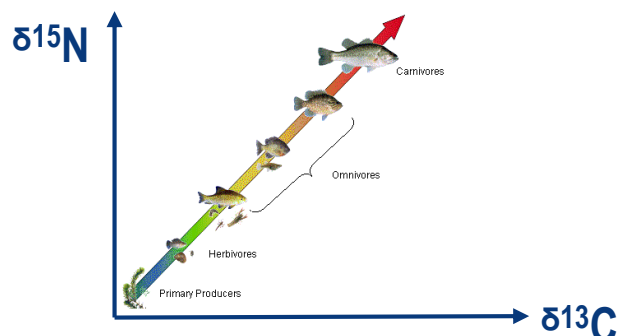
농업 및 환경과학적 동위원소 분석

Cat. No.	Description	Method	Sample Size	Time (days)
<u>Hydrogen (D/H) Isotope Analyses</u>				
AH01	^2H of cellulose - duplicate	EA-IRMS	0.1 g	28
AH01E	^2H of cellulose - 20% in duplicate	EA-IRMS	0.1 g	28
AH11	^2H of water - duplicate	equilibration	5 mL	14
AD11	^2H and ^{18}O of water - duplicate	equilibration	5 mL	14
AH36	Azeotropic distillation of water from plant or soil	---	Enquire	21
<u>Carbon Isotope Analyses</u>				
AC01	^{13}C of ground plant or soil - duplicate	EA-IRMS	0.5 g	21
AC01E	^{13}C of ground plant or soil - 20% in duplicate	EA-IRMS	0.5 g	21
AC01W	^{13}C of ground plant or soil - pre-prepared capsule	EA-IRMS	Enquire	21
AD01	^{13}C & ^{15}N of ground plant or soil - duplicate	EA-IRMS	0.5 g	21
AD01E	^{13}C & ^{15}N of ground plant or soil - 20% in duplicate	EA-IRMS	0.5 g	21
AD01W	^{13}C & ^{15}N of ground plant or soil - pre-prepared capsule	EA-IRMS	Enquire	21
AC15	^{13}C of atmospheric carbon dioxide (CO_2) - per tube	CF-IRMS	12 mL	14
AC17	^{13}C of dissolved inorganic carbon (DIC) - duplicate	CF-IRMS	Enquire	21
<u>Nitrogen Isotope Analyses</u>				
AN01	^{15}N of ground plant or soil - duplicate	EA-IRMS	0.5 g	21
AN01E	^{15}N of ground plant or soil - 20% in duplicate	EA-IRMS	0.5 g	21
AN01W	^{15}N of ground plant or soil - pre-prepared capsule	EA-IRMS	Enquire	21
AD01	^{15}N and ^{13}C of ground plant or soil - duplicate	EA-IRMS	0.5 g	21
AD01E	^{15}N and ^{13}C of ground plant or soil - 20% in duplicate	EA-IRMS	0.5 g	21
AD01W	^{15}N and ^{13}C of ground plant or soil - pre-prepared capsule	EA-IRMS	Enquire	21
AN07	^{15}N of ground plant or soil (^{15}N enriched) - duplicate	EA-IRMS	0.2 g	21
<u>Oxygen Isotope Analyses</u>				
AO01	^{18}O of cellulose - duplicate	EA-IRMS	0.1 g	28
AO01E	^{18}O of cellulose - 20% in duplicate	EA-IRMS	0.1 g	28
AO11	^{18}O of water - duplicate	equilibration	5 mL	14
AD11	^{18}O and ^2H of water - duplicate	equilibration	5 mL	14
AO36	Azeotropic distillation of water from plant or soil	---	Enquire	21
<u>Sulfur Isotope Analyses</u>				
AS01	^{34}S of ground plant or soil - duplicate	EA-IRMS	0.5 g	21
AS01E	^{34}S of ground plant or soil - 20% in duplicate	EA-IRMS	0.5 g	21
AS01W	^{34}S of ground plant or soil - pre-prepared capsule	EA-IRMS	Enquire	21

생태학적 안정 동위원소 분석

Cat. No.	Description	Method	Sample Size	Time (days)
Hydrogen (D/H) Isotope Analyses				
EH01	^2H of animal tissue - duplicate	EA-IRMS	0.1 g	28
EH01E	^2H of animal tissue - 20% in duplicate	EA-IRMS	0.1 g	28
EH11	^2H of water - duplicate	equilibration	5 mL	14
ED11	^2H and ^{18}O of water - duplicate	equilibration	5 mL	14
EH36	Azeotropic distillation of water from plant or soil	---	Enquire	21
Carbon Isotope Analyses				
EC01	^{13}C of dry plant or animal tissue - duplicate	EA-IRMS	0.2 g	21
EC01E	^{13}C of dry plant or animal tissue - 20% in duplicate	EA-IRMS	0.2 g	21
EC01W	^{13}C of dry plant or animal tissue - pre-prepared capsule	EA-IRMS	Enquire	21
ED01	^{13}C & ^{15}N of dry plant or animal tissue - duplicate	EA-IRMS	0.2 g	21
ED01E	^{13}C & ^{15}N of dry plant or animal tissue - 20% in dupl.	EA-IRMS	0.2 g	21
ED01W	^{13}C & ^{15}N of dry plant or animal tissue - pre-prepared capsule	EA-IRMS	Enquire	21
EC04	^{13}C of marine filtrate - per 25 mm filter	EA-IRMS	Enquire	21
ED04	^{13}C & ^{15}N of marine filtrate - per 25 mm filter	EA-IRMS	Enquire	21
EC15	^{13}C of atmospheric carbon dioxide (CO_2) - per tube	CF-IRMS	12 mL	14
EC17	^{13}C of dissolved inorganic carbon (DIC) - duplicate	CF-IRMS	Enquire	21
Nitrogen Isotope Analyses				
EN01	^{15}N of dry plant or animal tissue - duplicate	EA-IRMS	0.2 g	21
EN01E	^{15}N of dry plant or animal tissue - 20% in duplicate	EA-IRMS	0.2 g	21
EN01W	^{15}N of dry plant or animal tissue - pre-prepared capsule	EA-IRMS	Enquire	21
ED01	^{15}N and ^{13}C of dry plant or animal tissue - duplicate	EA-IRMS	0.2 g	21
ED01E	^{15}N and ^{13}C of dry plant or animal tissue - 20% in duplicate	EA-IRMS	0.2 g	21
ED01W	^{15}N and ^{13}C of dry plant or animal tissue - pre-prepared capsule	EA-IRMS	Enquire	21
EN04	^{15}N of marine filtrate - per 25 mm filter	EA-IRMS	Enquire	21
ED04	^{15}N and ^{13}C of marine filtrate - per 25 mm filter	EA-IRMS	Enquire	21
Oxygen Isotope Analyses				
EO01	^{18}O of animal tissue - duplicate	EA-IRMS	0.1 g	28
EO01E	^{18}O of animal tissue - 20% in duplicate	EA-IRMS	0.1 g	28
EO11	^{18}O of water - duplicate	equilibration	5 mL	14
ED11	^{18}O and ^2H of water - duplicate	equilibration	5 mL	14
EO36	Azeotropic distillation of water from plant or soil	---	Enquire	21
Sulfur Isotope Analyses				
ES01	^{34}S of dry plant or animal tissue - duplicate	EA-IRMS	0.2 g	21
ES01E	^{34}S of dry plant or animal tissue - 20% in duplicate	EA-IRMS	0.2 g	21
ES01W	^{34}S of dry plant or animal tissue - pre-prepared capsule	EA-IRMS	Enquire	21

- 영양분 섭취
- 동물 이주
- 영양 수준의 이해
- 오염 및 오염 물질 식별 및 추적
- Biogeochemical 사이클 이해



식품 신뢰성을 위한 안정 동위원소 분석

Cat. No.	Description	Method	Sample Size	Time (days)
Hydrogen (D/H) Isotope Analyses				
FH11T	^2H of water in fruit juice - priority - triplicate	equilibration	10 mL	7
FD11T	^2H and ^{18}O of water in fruit juice - priority - triplicate	equilibration	10 mL	7
Carbon Isotope Analyses				
FC03	^{13}C of maple syrup - duplicate	EA-IRMS	20 mL	14
FC03	^{13}C of fruit juice sugar - duplicate	EA-IRMS	20 mL	14
FC03X	^{13}C of fruit juice sugar - priority - duplicate	EA-IRMS	20 mL	3
Oxygen Isotope Analyses				
FO11T	^{18}O of water in fruit juice - priority - triplicate	equilibration	10 mL	7
FD11T	^{18}O and ^2H of water in fruit juice - priority - triplicate	equilibration	10 mL	7

- 진위성, 순수 및 지리적 근거의 증거 제공
- 벌크, 화합물 및 위치별 분석

- Honey
- Meat
- Palm oil
- Fruit juices
- Wine
- Rice
- Olive oil
- Fruit juice
- Cheese
- Spices
- Saffron
- Wheat

Results - Carbon isotope analysis of the separated protein fraction from retail palm sugars

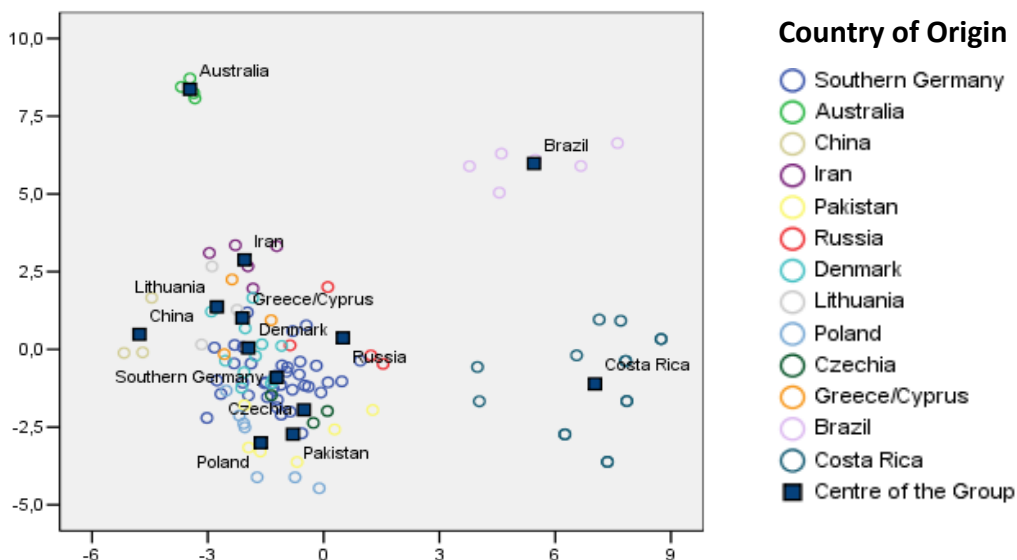
SAMPLE I.D.	protein	bulk	estimate of cane sugar content
	$^{13}\text{C}\text{‰}$	$^{13}\text{C}\text{‰}$	
Palm sugar sample 1	-23.32	-14.04	82
Palm sugar sample 2	-20.63	-12.99	89
Palm sugar sample 3	-21.39	-13.77	81
Palm sugar sample 4	-21.21	-14.86	69

법의학적 동위원소 분석

Cat. No.	Description	Method	Sample Size	Time (days)
Hydrogen (D/H) Isotope Analyses				
CH01T	^2H of organic solid - priority - triplicate	EA-IRMS	Enquire	14
CH03T	^2H of organic liquid - priority - triplicate	EA-IRMS	Enquire	14
Carbon Isotope Analyses				
CC01T	^{13}C of organic solid - priority - triplicate	EA-IRMS	0.1 g	14
CD01T	^{13}C & ^{15}N of organic solid - priority - triplicate	EA-IRMS	0.1 g	14
CC03T	^{13}C of organic liquid - priority - triplicate	EA-IRMS	1 mL	14
CD03T	^{13}C & ^{15}N of organic liquid - priority - triplicate	EA-IRMS	1 mL	14
Nitrogen Isotope Analyses				
CN01T	^{15}N of organic solid - priority - triplicate	EA-IRMS	0.1 g	14
CN03T	^{15}N of organic liquid - priority - triplicate	EA-IRMS	1 mL	14
CD01T	^{15}N and ^{13}C of organic solid - priority - triplicate	EA-IRMS	0.1 g	14
CD03T	^{15}N and ^{13}C of organic liquid - priority - triplicate	EA-IRMS	1 mL	14
Oxygen Isotope Analyses				
CO01T	^{18}O of organic solid - priority - triplicate	EA-IRMS	Enquire	14
CO03T	^{18}O of organic liquid - priority - triplicate	EA-IRMS	Enquire	14
Sulfur Isotope Analyses				
CS01T	^{34}S of organic sample - priority - triplicate	EA-IRMS	0.1 g	14
CS02T	^{34}S of inorganic sample - priority - triplicate	EA-IRMS	0.1 g	14

- Explosives
- Linking illegal drugs seizures
- Rhino horn
- Ivory
- Currency
- Soil
- Humans

2-dimensional C & S analysis of hair samples from people from different countries



의학 연구를 위한 동위원소 분석

Cat. No.	Description	Method	Sample Size	Time (days)
<u>Hydrogen (D/H) Isotope Analyses</u>				
MH11	^2H for TBW or TEE measurement - duplicate	equilibration	1 mL	14
MD11	^2H and ^{18}O of doubly labelled water - duplicate	equilibration	1 mL	14
<u>Carbon Isotope Analyses</u>				
MC01	^{13}C of dried end-product or metabolite -duplicate	EA-IRMS	0.2 g	21
MC14	^{13}C of carbon dioxide in breath - priority - per tube	CF-IRMS	12 mL	7
MC19	^{13}C of bicarbonate in blood - duplicate	CF-IRMS	Enquire	21
MC20	^{13}C of amino acid by decarboxylation - duplicate	CF-IRMS	Enquire	21
MC41	^{13}C of urea breath test - priority - per test kit	CF-IRMS	2 x 12 mL	7
<u>Nitrogen Isotope Analyses</u>				
MN01	^{15}N of dried end-product or metabolite	EA-IRMS	0.2 g	21
<u>Oxygen Isotope Analyses</u>				
MO11	^{18}O for total body water measurement - duplicate	equilibration	1 mL	14
MD11	^{18}O and ^2H of doubly labelled water - duplicate	equilibration	1 mL	14

CARBON-13 ($^{13}\text{CO}_2$) BREATH TESTING

- Liver Function Breath Tests
- Gastric Emptying Breath Tests
- Bacterial Overgrowth Breath Tests
- Oro-Caecal Transit Time Breath Tests
- Other Breath Tests

Doubly Labelled Water (DLW) method

- index of energy expenditure

지구화학을 위한 동위원소 분석

Cat. No.	Description	Method	Sample Size	Time (days)
<u>Hydrogen (D/H) Isotope Analyses</u>				
GH01	^2H of kerogen - duplicate	EA-IRMS	0.1 g	28
GH03	^2H of whole oil or oil fraction - duplicate	EA-IRMS	0.1 g	28
GH11T	^2H of water or brine - triplicate	equilibration	5 mL	14
GD11T	^2H and ^{18}O of water or brine - triplicate	equilibration	5 mL	14
GH35	^2H of <u>core water (deuterium labelled)</u> - duplicate	equilibration	1 mL	14
<u>Carbon Isotope Analyses</u>				
GC01	^{13}C of kerogen - duplicate	EA-IRMS	0.1 g	21
GC03	^{13}C of whole oil or oil fraction - duplicate	EA-IRMS	0.1 g	21
GD16	^{13}C and ^{18}O of carbonate by acid digestion - duplicate	CF-IRMS	0.2 g	21
GD39	Sampling of carbonate from mineral	---	Enquire	21
<u>Oxygen Isotope Analyses</u>				
GO11T	^{18}O of water or brine - triplicate	equilibration	5 mL	14
GD11T	^{18}O and ^2H of water or brine - triplicate	equilibration	5 mL	14
GD16	^{18}O and ^{13}C of carbonate by acid digestion - duplicate	CF-IRMS	0.2 g	21
GD39	Sampling of carbonate from mineral	---	Enquire	21
<u>Sulfur Isotope Analyses</u>				
GS01	^{34}S of whole oil or oil fraction - duplicate	EA-IRMS	0.1 g	21
GS02	^{34}S of sulfate, sulfide or sulfur bearing mineral - duplicate	EA-IRMS	0.1 g	21
GS33	^{34}S of sulfate in water sample - duplicate	EA-IRMS	200 mL	21
GS51	Purification of sulfide sample	---	Enquire	21

안정동위원소 연구실의 표준 보정 서비스

Cat. No.	Description	Method	Sample Size	Time (days)
<u>Hydrogen (D/H) Isotope Analyses</u>				
SH11	^2H of water - 3 days x 5 reps.	equilibration	20 mL	21
SD11	^2H & ^{18}O of water - 3 days x 5 reps.	equilibration	20 mL	21
<u>Carbon Isotope Analyses</u>				
SC01	^{13}C of solid or liquid - 3 days x 5 reps.	EA-IRMS	1 g	21
SD01	^{13}C & ^{15}N of solid or liquid - 3 days x 5 reps.	EA-IRMS	1 g	21
SD12	^{13}C & ^{18}O of pure carbon dioxide - 3 days x 5 reps.	CF-IRMS	Enquire	21
SD13	^{13}C & ^{18}O of 10+% carbon dioxide - 3 days x 5 reps.	CF-IRMS	Enquire	21
SD14	^{13}C & ^{18}O of 1 - 10% carbon dioxide - 3 days x 5 reps.	CF-IRMS	Enquire	21
SD16	^{13}C & ^{18}O of carbonate - 3 days x 5 reps.	CF-IRMS	1 g	21
<u>Nitrogen Isotope Analyses</u>				
SN01	^{15}N of solid or liquid - 3 days x 5 reps.	EA-IRMS	1 g	21
SD01	^{15}N and ^{13}C of solid or liquid - 3 days x 5 reps.	EA-IRMS	1 g	21
<u>Oxygen Isotope Analyses</u>				
SO11	^{18}O of water - 3 days x 5 reps.	equilibration	20 mL	21
SD11	^{18}O & ^2H of water - 3 days x 5 reps.	equilibration	20 mL	21
<u>Sulfur Isotope Analyses</u>				
SS01	^{34}S of organic sample - 3 days x 5 reps.	EA-IRMS	1 g	21
SS02	^{34}S of inorganic sample - 3 days x 5 reps.	EA-IRMS	1 g	21