

## Tracing Hydrogen, Oxygen and Carbon Isotopes to determine Coke & Coconut water Composition

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### Research Aims:

- Determine the source and composition of Coke and Coconut water using  $\delta^2\text{H}$ ,  $\delta^{18}\text{O}$  and  $\delta^{13}\text{C}$
- Are there any trends within the United States?
  - Global trend?

### Methodology:

EA-IRMS  
Coke & Coconut Water pipetted into silver capsules, dried overnight in an oven, then crimped.  
Sealed capsules analyzed on an Elemental Analyzer – Isotope Ratio Mass Spectrometer for  $\delta^{13}\text{C}$

Picarro (CRDS)  
Water distilled from Coke & Coconut Water samples by cryogenic distillation.  
Water was then injected into the CRDS for  $\delta^2\text{H}$  and  $\delta^{18}\text{O}$

### Discussion:

(Fig.1) Most Coke samples are made with high fructose corn syrup ( $\text{C}_4$ ) or sugar cane ( $\text{C}_4$ ) and are in the  $-10\text{‰}$  to  $-12\text{‰}$  range. Few samples (mainly UK) have sugar from beets ( $\text{C}_3$ ) and have carbon isotope ratio of around  $-25\text{‰}$ .

(Fig. 2) Most coke samples contain corn or cane sugar ( $\text{C}_4$ ; around  $-10$  to  $-12 \text{‰}$ ) except few indicating beet sugar source ( $\text{C}_3$ ,  $-25.43 \text{‰}$ ).

(Fig. 3) Coconut water samples do not fall on the GMWL. Lower slope value ( $<8$ ) in coconut water indicates that the source is natural coconut.

(Fig. 4) Most coconut waters do not have added sugars, with the exception being some samples from USA, which show added sugar cane or corn syrup signature.

### Results:

