

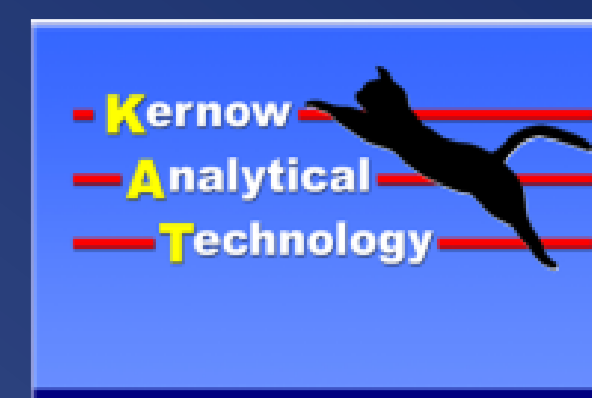
# Separation, Identification and Measurement of the 'Polar' Constituents of Crude Oils

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RESEARCH WITH PLYMOUTH UNIVERSITY

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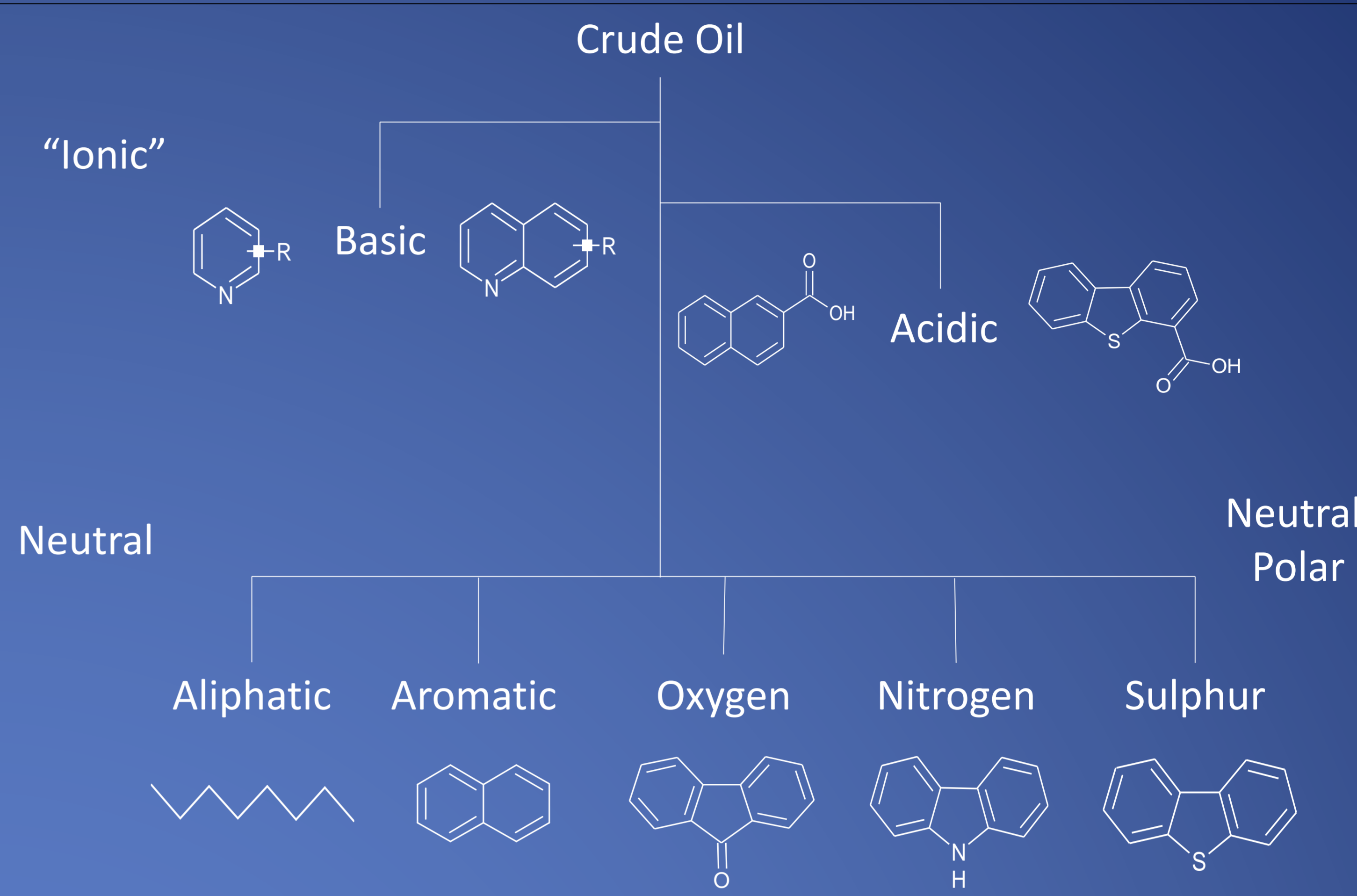
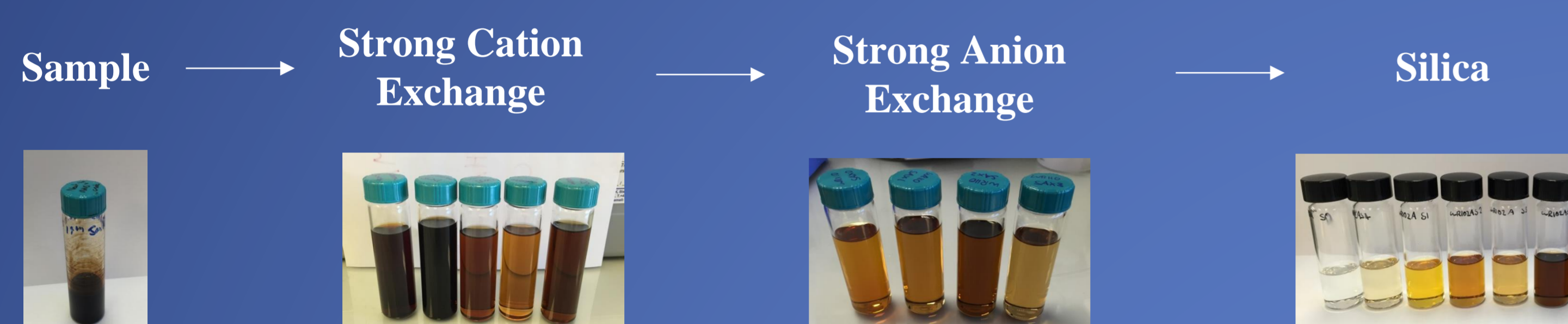
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## Aims and Objectives

- Develop method for separation of crude oils to isolate clean fractions of polar compound classes
- Validate method using multi-compound standard
- Apply method to a number of oils of different quality
- Evaluate the method (cf. Snyder method)
- Characterise "polar" constituents of a wide variety of crude oils utilising advanced analytical techniques such as GCxGC-MS and LC-Orbitrap MS

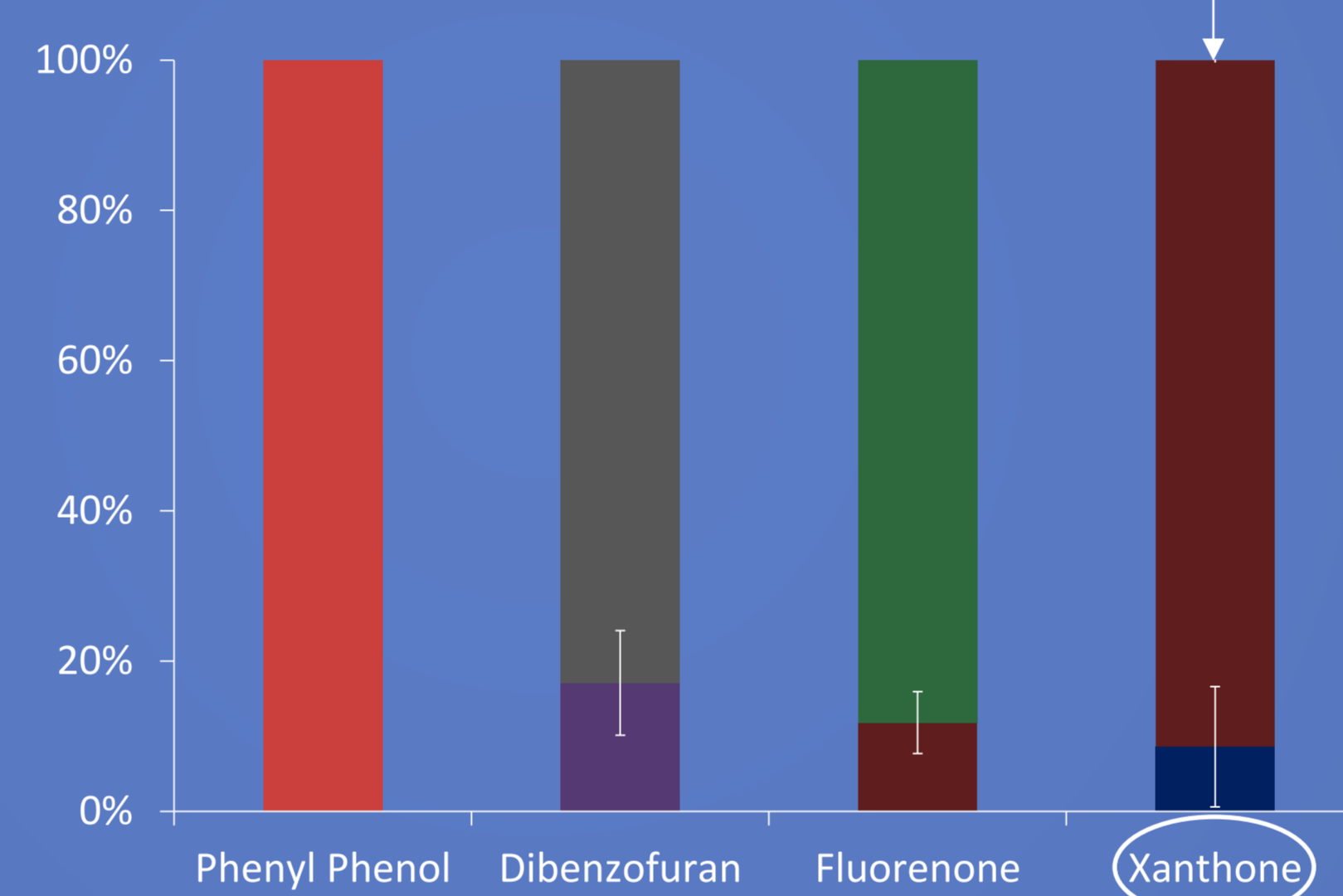
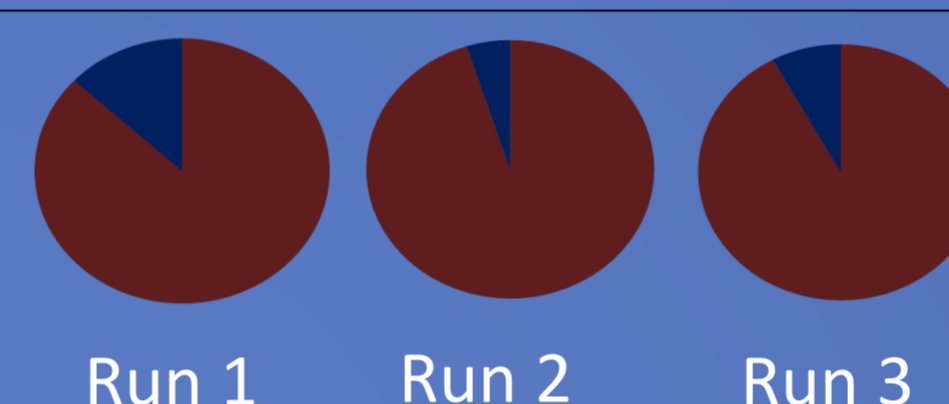
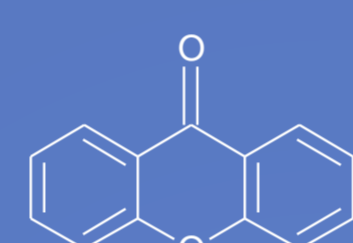
## Methodology



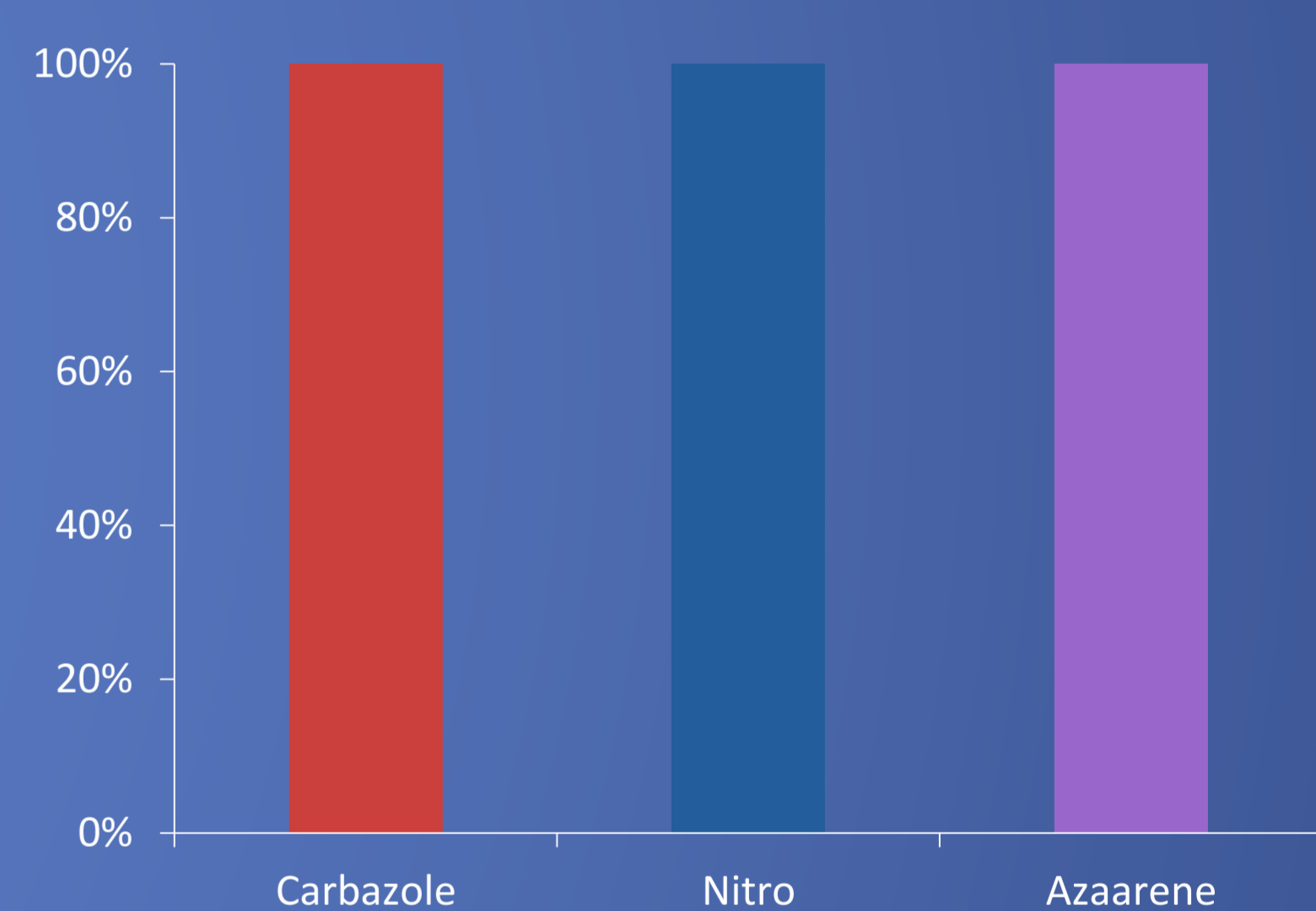
## Validate with Mixed Polar Standard

- 26 compounds representing polar classes present in crude oils
- Standards quantitated within fractions both alone and when spiked into a crude oil
- Fractions analysed for standards using a variety of techniques and quantitated using external calibration series
- Standard location allows prediction of compound class location
- Pie charts show percentage of total recovered standards in fractions
- Data averaged into stacked bar charts of similar compounds class

## Example 1- Oxygenated (Xanthone)

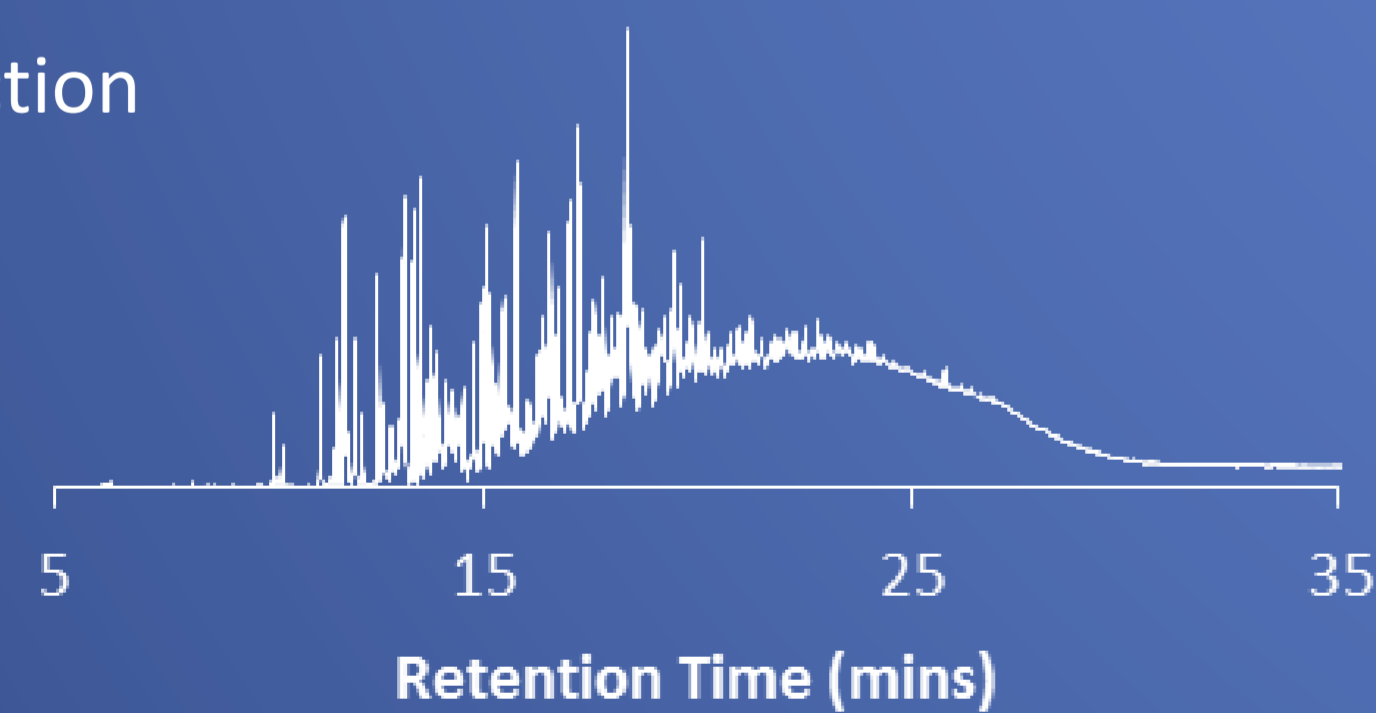


## Example 2- Nitrogen Containing

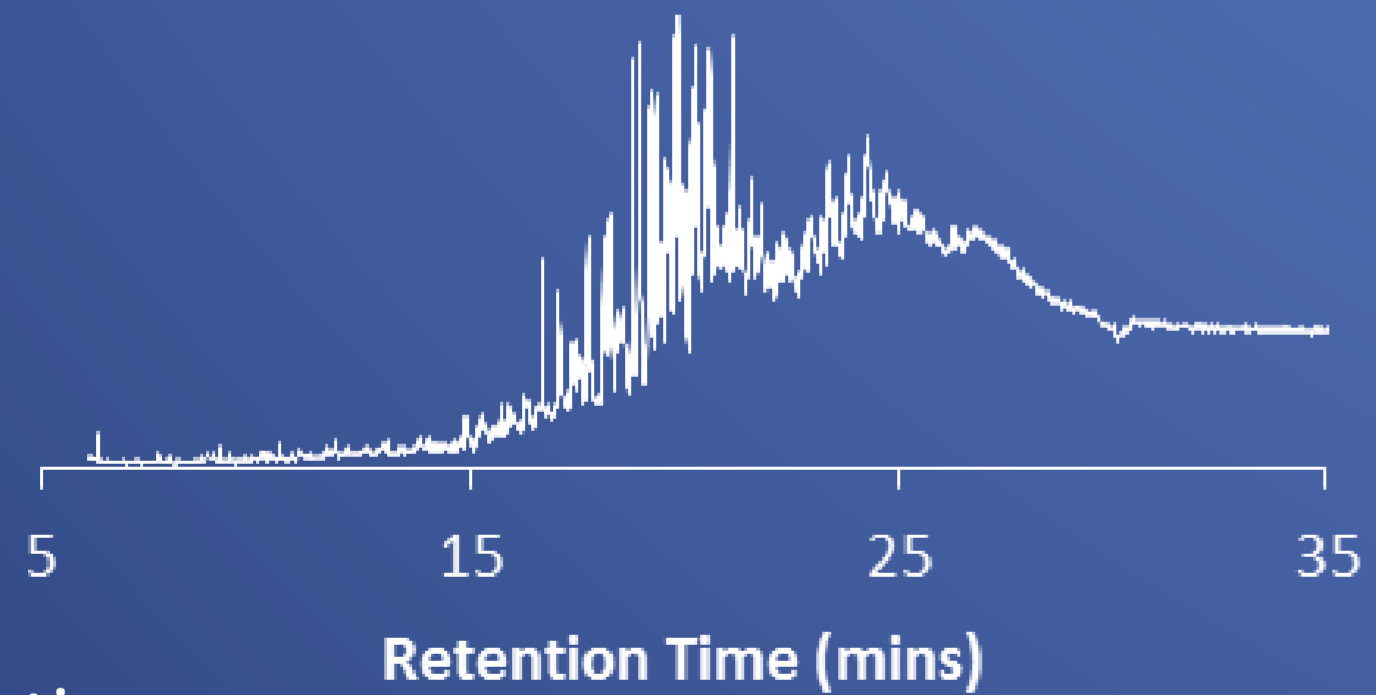
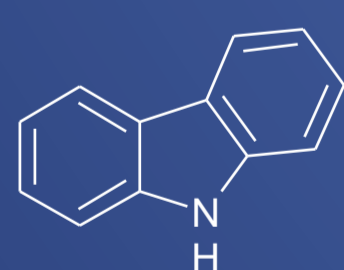


## Application of method to Alaska North Slope- GCxGC MS

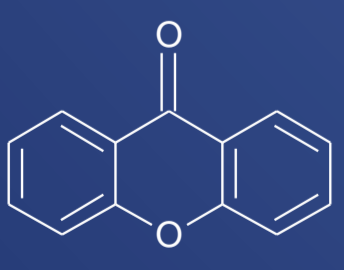
### Aromatic Fraction



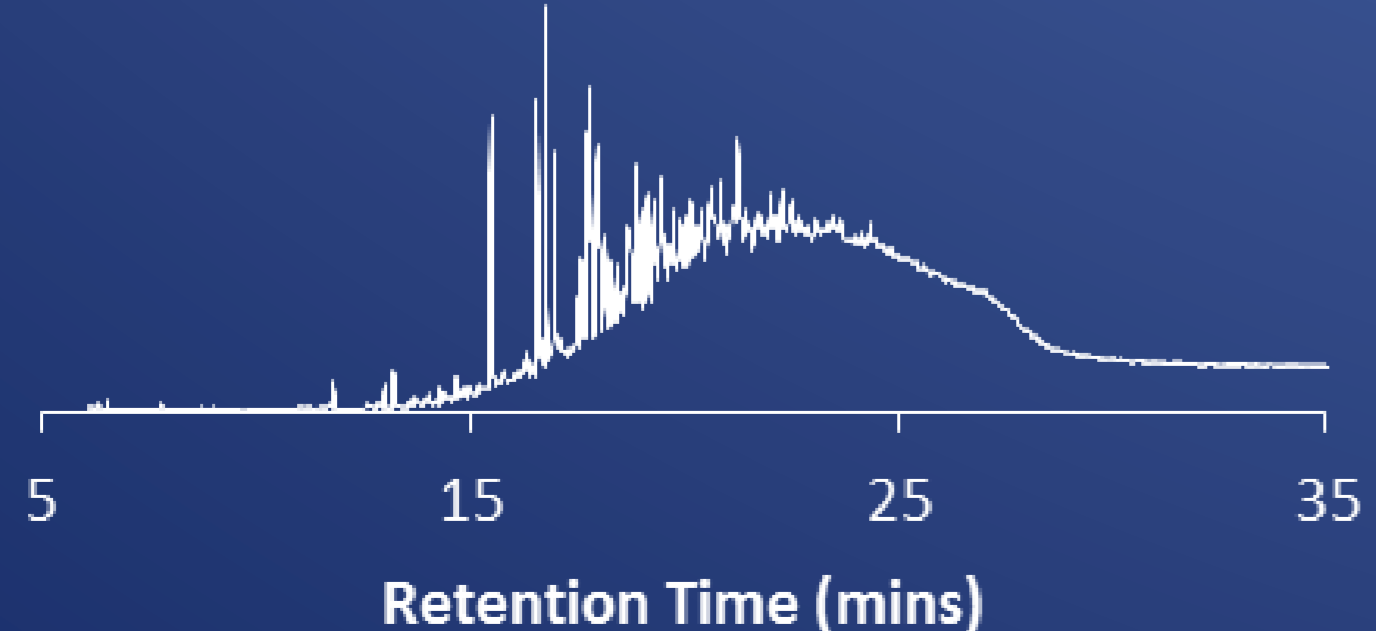
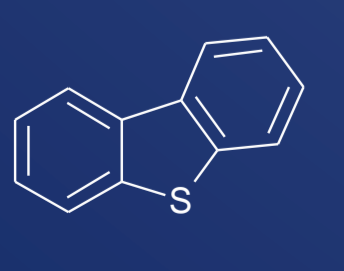
### Carbazole Fraction



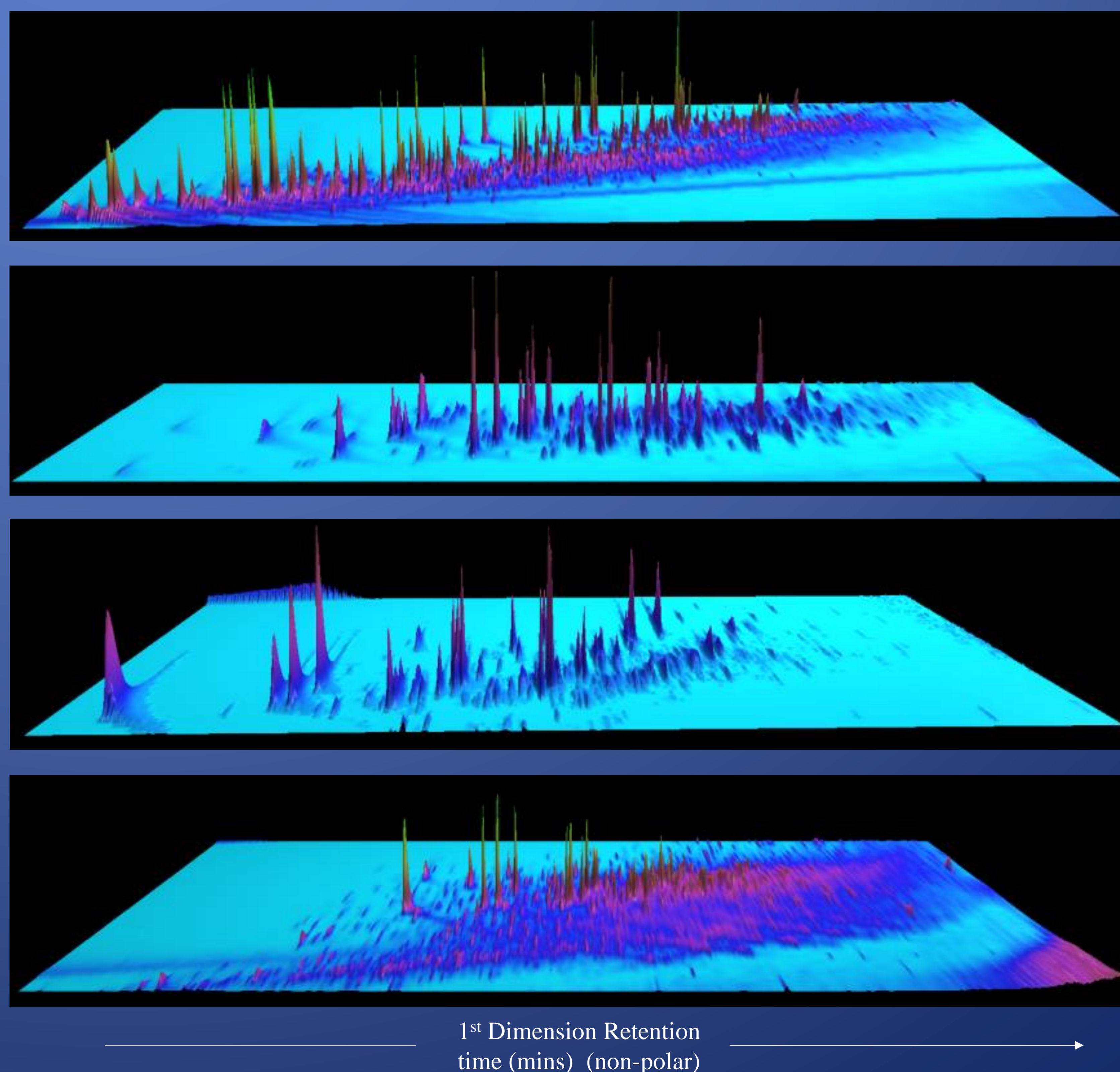
### Xanthone Fraction



### Thiophene Fraction



2<sup>nd</sup> Dimension Retention time (secs) (polar)



## Acknowledgements

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## References

Snyder, L. R. and B. E. Buell (1968). "Nitrogen and oxygen compound types in petroleum. A general separation scheme." *Analytical Chemistry* 40(8): 1295-1302.  
Sutton, P. A. and S. J. Rowland (2014). "Determination of the Content of C80 Tetraacids in Petroleum." *Energy & Fuels* 28(9): 5657-5669.