

# New routes to solutions of oil charge conundrums: $\gamma$ - ray Photons, Mass Fraction Maturity and Fourier Transform Mass Spectrometry.

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## Introduction

Quantitative estimates of the actual oil charge contributions to reservoirs, migration routes and even the timing of oil charging remain elusive in many basins, despite the huge scientific and economic importance of resolving these issues as most of our approaches are based on concepts from the 1980s and 1990s. Similarly, while advances have been dramatic in understanding the quantitative aspects of the biodegradation process, further development is still needed because most conventional petroleum geochemical approaches are not reliable at the heavy and severe levels of biodegradation seen in severely degraded oils. In this paper we describe recent approaches which might shed light on these questions and quantitatively resolve the qualitative debates that have been raging for decades.

## Material and Methods

We review the state of the art in oil charge analysis of heavy and severely degraded oils using new techniques such as the ultra high resolution characterization of the polar components of oil by FTMS and we review advances necessary to really assess the true maturity spectra, or mass fraction maturity, of crude oils.

## Conclusion

We present a roadmap for the development of the necessary new petroleum system technologies needed, including a new approach to a practical oil reservoir-residence time dating tool based on hydrocarbon radiolysis.