
EC020: Petroleum Generation and Migration

Format and Duration
Self-Paced - 5 Hours

Summary

The aim of geochemistry in exploration, development and field production is to apply our scientific understanding of the chemistry and physics of fluids in sedimentary basins to the prediction and risking of petroleum accumulations. This involves assessing source rock presence, type and maturity as well as the reservoir petroleum composition and the migration of the hydrocarbon prior to trapping. Using detailed imagery, case studies and interactive content this course will give the learner the tools and knowledge required to begin making geochemical analyses for use in volumetric and economic assessments.

Learning Outcomes

Participants will learn to:

1. Understand the composition and compounds that make up petroleum.
2. Characterise kerogen using Organic Petrography, Elemental Analysis and Organofacies techniques.
3. Characterise source rocks using Total Organic Carbon, Rock Eval and Pyrolysis Gas Chromatography techniques.
4. Learn about hydrocarbon generation from biogenic processes, thermogenic processes and coals.
5. Calibrate thermal modelling by using Vitrinite Reflectance, Spore Colouration Index and Rock Eval Tmax techniques as maturity indicators.
6. Learn about molecular maturity methods to analyse hydrocarbons from expulsion to accumulation.
7. Understand primary and secondary migration processes and the formation of complex subsurface overpressure patterns.
8. Learn how to estimate volume and phase to predict hydrocarbon in place, to be used in volumetric and economic assessments.

Training Method

This is a self-paced e-learning course, approximately 5 hours learning time, consisting of 5 modules. Within each module the learning materials are structured into short sections, each including interactive text and image content, animations, video, and audio. Each module has a scored quiz at the end to provide the participant with their learning progress.

Who Should Attend

This course is aimed at subsurface professionals who are keen to learn more about petroleum geochemistry to evaluate and de-risk prospects and plays.

Course Content

Petroleum Generation and Migration - Introduction

This module provides an overview of geochemical principles used in the petroleum industry. It will cover how petroleum is formed and look in detail at petroleum compounds. Participants will also learn about phase, the importance of phase with respect to hydrocarbon accumulations and how to interpret a petroleum phase diagram.

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Source Rocks

This module teaches about kerogen formation and classification. Learners are introduced to the techniques used to characterise kerogen and source rocks and learn how to identify source facies and potential. Finally, the module looks at total soluble extracts and the saturate gas chromatograph.

Generation and Expulsion Processes

This module starts by introducing learners to Methanogenic Archaea and looks at their role in biogenic gas formation, the effect of temperature control and biogenic gas volumetrics. Various biogenic gas case studies will be considered. The module then moves onto thermogenic processes with respect to hydrocarbon generation and considers expulsion and accumulation. Finally, learners will gain an appreciation of gas generation from coals.

Maturity Measurements

This module explores the three measurement types used in thermal modelling, including vitrinite reflectance, spore colouration index and rock eval Tmax. The learner will develop an understanding of the methods and uses of each technique along with an appreciation of the respective advantages and disadvantages. The module then looks at molecular maturity techniques and the common molecular reactions. Finally, the fragmentogram and its analysis will be introduced.

Petroleum Migration

The final module in this course considers petroleum migration. The learner will develop an understanding of the causes of overpressure and the formation of complex overpressure patterns using the North Sea Brent Province as a case study for pressure transmission. How to calculate the petroleum fluid potential and the effect on seal capacity, particularly with respect to the maximum petroleum column height will be shown. The second half of the module looks at secondary migration and petroleum losses. The effect of faults will be considered as the learner gains an appreciation of migration path and trapping. Finally, this module will explain how to estimate volume and phase to assist volumetric calculations and economics.