Geochemical Applications in Petroleum Systems

MICHAEL FORMOLO[1] AND MICHAEL LAWSON[2]

[1]ExxonMobil Upstream Research Company, Spring, TX 77389, *michael.j.formolo@exxonmobil.com

[2]ExxonMobil Exploration Company, Spring, TX 77389

A 2018 study from the U.S. Energy Information Administration projects a 28% increase in world energy needs by 2040 [1]. The majority of energy demand will continue to be met by traditional resources such as petroleum and natural gas. While these modeled projections have some degree of uncertainty, technological advances in liquids and gas production are clearly required to meet these demands. Additionally, this increased demand is likely to drive hydrocarbon exploration into increasingly challenging environments [2]. For decades, geochemistry has been an integral part in advancing our understanding of fossil fuel systems [3]. The development of novel geochemical technologies will continue to be of critical importance in the exploration and recovery of hydrocarbons in the future.

This overview pays tribute to the petroleum system as defined by Magoon and Dow [3] as a logical framework of related elements (e.g. source, maturation, etc.) to address the impact of geochemistry in petroleum systems. This includes early advancements that have become routine in the industry, such as molecular and isotope chemistry of oil and gas, and the development of new tools, such as novel isotopic tracers, many of which are featured in this session.

In this presentation, we discuss the knowledge gaps that remain in understanding the formation, migration and accumulation of hydrocarbons, and how geochemical approaches and pioneering new technologies may help to address them. Case studies will highlight the power of integrating traditional and innovative geochemical data to further our understanding of complex fossil fuel systems.

Development of new geochemical tools is important not only in analyzing petroleum systems, but also in aiding efforts to manage and mitigate environmental risk. Geochemical tools able to characterize hydrocarbon resources and be used for forensic fingerprinting are key to responsible exploration and recovery of hydrocarbons to meet the growing energy demand.

[1] US EIA Annual Energy Outlook 2018, [2] Lawson et al. (2018) *GSL Spec. Pub.* 468, [3] Hedberg (1964) *AAPG Bulletin* 48, 1755-1803, [4] Magoon and Dow (1994) *AAPG Memoir* 60, 3-24.