Please fill in the name of the event you are preparing this abstract for.	International Petroleum Technology Conference
Please fill in your 5-digit IPTC manuscript number and IPTC Control number.	IPTC-19293-MS 19IPTC-P-957-IPTC
Please fill in your abstract title.	Noble Gas Geochemistry: Implications for Hydrocarbon Exploration

Please fill in your author name(s) and company affiliation.

Given Name	Surname	Company
ZhenZhu	Wan	Saudi Aramco
Clara	Castro	Saudi Aramco
Khaled	Arouri	Saudi Aramco
Conrad	Allen	Saudi Aramco

Abstract

As noble gases (Helium-He, Neon-Ne, Argon-Ar, Krypton-Kr and Xenon-Xe) are chemically inert, they do not undergo chemical reactions as they move from source to sink. Since natural gases act as a carrier during hydrocarbon migration, specific characteristics of noble gases have the potential to track petroleum migration and assess reservoir compartmentalization.

Natural gas samples were collected from several clastic reservoirs, together with gas samples from a shale source-reservoir rock. All gas samples were analyzed for their noble gas abundances and isotopic compositions, as well as for hydrocarbon compositions and stable carbon isotope ratios.

High ratios of $^{21}Ne/^{22}Ne$, $^{40}Ar/^{36}Ar$ and $^{136}Xe/^{130}Xe$ suggest a crustal origin for the noble gases. There is no readily discernible correlation between concentrations of CH_4 and that of ^{4}He. Same applies when correlating methane abundances with those of other noble gases, with the exception of only one section, where a positive correlation exists between CH_4 concentration and $^{21}Ne/^{22}Ne$ ratio, on one hand, and with the $^{40}Ar/^{36}Ar$ ratio, on the other hand, suggesting a common transport mechanism of those crustal gases, possibly via a deep fault system. Trends of noble gas concentrations and their isotopic ratios, especially the decreased helium concentration values towards the northern part of the study area, may indicate a northward migration pathway. Distinct spatial distribution of noble gas composition/concentrations and isotopic ratios, e.g. ^{4}He, ^{21}Ne and ^{40}Ar of crustal origin, suggest different episodic migration and charging to the current reservoirs, with the northern areas having received their gases earlier. Additionally, reservoir compartmentalization was possible to infer especially in areas with distinctly different noble gas isotopic compositions.

Results of noble gas analysis have shown invaluable implications regarding natural gas migration pathways, relative timing of charging, and reservoir compartmentalization in the study area.