

Stable isotope systematics of coalbed methane: Desorption and production

MARTIN NIEMANN^{1*} AND MICHAEL J. WHITICAR²

¹Geoservices S.A., 93151 Le Blanc Mesnil, France

(*correspondence: martin.niemann@geoservices.com)

²School of Earth and Ocean Sciences, University of Victoria, V8W 2Y2, Victoria, BC, Canada (whiticar@uvic.ca)

Coalbed methane (CBM) is a growing resource for natural gas. Although there has been considerable basic geochemical research on CBM, the application of stable carbon and hydrogen isotope ratios of CBM are not common.

In our study, 1000 CBM samples were collected and analyzed by CF-IRMS during 10 different sample campaigns in 7 different coal bearing basins. Seven sample sets were collected during desorption experiments and 3 were collected from CBM production wells. The coals range in maturity from subbituminous A to anthracite and cover a wide range of different maceral compositions. Samples span canister desorption times of up to 2773 hours and production time of up to 6312 hours.

Gas compositions do not show any significant trends with increasing production/desorption time, however, the $\delta^{13}\text{C}-\text{CH}_4$ values do vary with production/desorption time. Samples from desorption experiments express the expected ^{13}C enrichment for CH_4 with increasing desorption time (isotope shifts up to 43.4‰). In specific instances, a ^{12}C enrichment is also observed (isotope shifts up to 3.1‰). Production samples show a trend opposite to the desorption samples, with a general depletion in ^{13}C with increasing production time (isotope shifts up to 35.8‰).

$\delta^{13}\text{C}-\text{CH}_4$ values do not display the expected compositions of CH_4 generated from coals. This indicates the influence of secondary processes. The processes mixing, adsorption, desorption and diffusion are significant for the alteration and liberation of CBM. The significant alteration of the CBM gases is treated as a combined effect of these processes, due to the challenges in reliably differentiating these processes.

A mixing model is presented to explain unexpected $\delta^{13}\text{C}-\text{CH}_4$ trends observed for some production samples. Interactions of mixing, desorption and diffusion as a function of time and distance is presented as a reasonable explanation for the observed trends.

Obsidian provenance studies from the Chalcolithic Sites of the Eastern Lake Urmia, Northwestern Iran

KAMAL ALDIN NIKNAMI AND
AHMAD CHAYCHI AMIRKHIZ

Department of Archaeology, University of Tehran, Enghlab Street, Tehran, Iran (kniknami@ut.ac.ir, ahmadchaychi@yahoo.com)

In 2005-2006 a major archaeological survey of obsidian finding and characterization was conducted to study the long-term use of obsidian in the eastern shores of Lake Urmia region, Northwestern Iran. In Iran, the early works suggested that almost all archaeological obsidians came from the Nemrud Dağ sources somewhere around the Lake Van in Asia Minor (Turkey). Through a characterization procedure it appeared that samples presenting the elemental composition might present similarities which can be attributable for a nearby unknown source in the region. This means that these samples had to come from yet unknown but possibly not very distant sources. Such compositional similarities between artifacts and sources material (geological samples) were found for the region where a large part of the raw obsidians could however be sourced. In order to improve our knowledge of Iranian obsidians and eventually refine provenance criteria we revisited about 56 Chalcolithic sites and some source areas. Both obsidian sources and samples compositions then were determined by PIXE and EDXRF instruments. This paper presents our first set of results from the trace elemental analysis of both source and worked obsidians that have provided important new data concerning the diachronic relationship between lithic technology and raw material in the northwestern Iran.