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EDITORIAL
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Editorial: Gas Geochemistry: New Progresses and Applications

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Editorial on the Research Topic

Gas Geochemistry: New Progresses and Applications

INTRODUCTION

Geosphere is constantly crossed by fluid fluxes of varying flow velocity and chemical composition. The development of gas geochemistry techniques over the last 50 years allowed of gaining a significant understanding of gas accumulations, gas fluxes, and their geological sources. Although gas geochemistry is a relatively recent discipline of geochemistry, advancements over the last 2 decades in sampling, storage and analysis of gas samples have enabled gas geochemistry to emerge as a critical scientific tool for constraining processes occurring in the geosciences. Chemical and isotopic features of various gas species have provided critical information about their origin, source, migration, and accumulation in specific environments, making gas geochemistry a widely used tool in a variety of fields of geosciences, including environmental/climate problems, geohazards, origin and evolution of rocks, as well as biogeochemical processes involving microbial activity. Due to the economic relevance of hydrocarbons and hydrothermal gases, they have been investigated more intensively than other gas types since very early time. Additionally, advances in our understanding of unconventional gases such as shale and tight gas in recent decades, represent new applications for these gas-related approaches. Over the last half-century, scientists in the field of gas geochemistry have exchanged their findings/experiments at major international scientific conferences organized by the International Conference on Gas Geochemistry (ICGG), the Geochemical Society, the American Geophysical Union (AGU), the European Geosciences Union (EGU), the American Association of Petroleum Geologists (AAPG), and the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI). Numerous applications of gas geochemistry in geology and the environment have been studied in recent years, and the present trend confirms that Earth and Environmental Sciences are the most promising domains for gas geochemistry applications. It is worth noting that advances in our understanding of noble/rare gas geochemistry are more closely tied to technology achievements than to fundamental geological knowledge. The current Research Topic has been devoted of compiling the most recent and pertinent experiences in the various domains of gas geochemistry. 23 papers presented but not limited in the 2019 ICGG meeting in Sicily have been accepted for publication.

Hereby it is useful to report the list of published papers by date of publications and a keyword at the end in parentheses able to roughly identify the basic field of interest. In particular the paper by:

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(1) Qin et al. reported about *Genetic Types, Distribution Patterns and Enrichment Mechanisms of Helium in China's Petroliferous Basins* (raw materials)
(2) Xia et al. reported about *The Characteristics of Organic Carbon in the Offshore Sediments Surrounding the Leizhou Peninsula, China* (hydrocarbons)
(3) Xiaobo et al. reported about *Differences on Geochemical Characteristics and Their Implicating Significances of Nitrogen in Coal-Derived Gas and Oil-typed Gas in China* (hydrocarbons)
(4) Wu et al. reported about *Inversion Characteristics of Hydrocarbon Gases Carbon Isotopes Varying With Temperature and Implications for Shale Exploration* (hydrocarbons)
(5) Longo et al. reported about *Black Sea Methane Flares From the Seafloor: Tracking Outgassing by Using Passive Acoustics* (hydrocarbons)
(6) Nicula et al. reported about *Geochemical Features of the Thermal and Mineral Waters From the Apuseni Mountains* (*Romania*) (geothermics)
(7) Melián et al. reported about *Insights from Fumarole Gas Geochemistry on the Recent Volcanic Unrest of Pico do Fogo, Cape Verde* (volcanic risk)
(8) Nguyễn et al. reported about *Radioactive Thoron ^{220}Rn Exhalation From Unfired Mud Building Material Into Room Air of Earthen Dwellings* (radioprotection in living environment)
(9) Wang et al. reported about *Potential Production of Carbon Gases and Their Responses to Paleoclimate Conditions: An Example From Xiaolongtan Basin, Southeast Tibetan Plateau* (hydrocarbons)
(10) Chen et al. reported about *Factors Controlling Natural Gas Accumulation in the Southern Margin of Junggar Basin and Potential Exploration Targets* (hydrocarbon)
(11) Liang et al. reported about *Preliminary Experimental Study of Methane Adsorption Capacity in Shale After Brittle Deformation Under Uniaxial Compression* (hydrocarbons)
(12) Ni et al. reported about *Geochemical Comparison of the Deep Gases From the Sichuan and Tarim Basins, China* (hydrocarbons)
(13) Daskalopoulou et al. reported about *Insight Into Hartoušov Mofette, Czech Republic: Tales by the Fluids* (tectonophysics)
(14) Gao et al. reported about *Characteristics of Organic Matter and Biomarkers in Core Sediments From the Offshore Area of Leizhou Peninsula, South China Sea* (hydrocarbons)
(15) Cao et al. reported about *The Paleoclimate Significance of the $\delta^{13}C$ Composition of Individual Hydrocarbon Compounds in the Maoming Oil Shales, China* (hydrocarbons)
(16) Zhang et al. reported about *Geochemical Characteristics of Gas and Flowback Water in Lake Facies Shale: A Case Study From the Junggar Basin, China* (hydrocarbons)
(17) Sun et al. reported about *Soil Degassing From the Xianshuihe–Xiaojiang Fault System at the Eastern Boundary of the Chuan–Dian Rhombic Block, Southwest China* (tectonophysics)
(18) Xiaowei et al. reported about *Catalytic Hydrogenation of Post-Mature Hydrocarbon Source Rocks Under Deep-Derived Fluids: An Example of Early Cambrian Yurtus Formation, Tarim Basin, NW China* (hydrocarbons)
(19) Fu et al. reported about *An Automatic System for Continuous Monitoring and Sampling of Groundwater Geochemistry in Earthquake-Prone Regions of SW Taiwan* (tectonophysics)
(20) Kim et al. reported about *Short-Term Monitoring of Geogenic Soil CO_2 Flux in a Non-Volcanic and Seismically Inactive Emission Site, South Korea* (tectonophysics)
(21) Sano et al. reported about *Groundwater Anomaly Related to CCS-CO_2 Injection and the 2018 Hokkaido Eastern Iburi Earthquake in Japan* (carbon capture and storage)
(22) Siino et al. reported about *Stochastic Models for Radon Daily Time Series: Seasonality, Stationarity, and Long-Range Dependence Detection* (data processing)
(23) Zafrir et al. reported about *The Impact of Atmospheric and Tectonic Constraints on Radon-222 and Carbon Dioxide Flow in Geological Porous Media—A Dozen-Year Research Summary* (tectonophysics)

CONCLUSION

52% of published papers is related to the geochemical characterization and to the study of the chemical and isotopic evolution of hydrocarbon gases. 22% of published papers is related to geochemical characterization and monitoring of geofluids in tectonophysics and seismicity-oriented researches. The other 26% of published papers is related to the research of raw materials, geothermal energy, groundwaters, volcanic risk, radioprotection, carbon capture and storage and to data processing of time series of recorded data. Current trends obtained by published papers indicate that Earth, Energy, and Environmental Sciences are the most promising fields for the application of Gas Geochemistry and of Noble/Rare Gas Geochemistry, as they are more concerned with technological advancements than with basic geological knowledge. A close collaboration with geophysical sciences demonstrated to be a winning approach to solve the increasingly difficult problems in Gas Geochemistry.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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