

The development and distribution of new $\delta^{13}\text{C}$ and $\delta^2\text{H}$ natural gas standard reference materials

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In the 1980s, the Chevron Oil Field Research Company developed and began distributing a suite of three natural gas standards that included a coal-associated gas (NGS1), an oil-associated gas (NGS2), and a biogenic gas (NGS3) [1]. Subsequently, the National Institute of Standards and Technology (NIST) provided recertified isotopic values, assumed responsibility for distribution, and renamed them RM 8559, RM 8560, and RM8561 [2]. Recently the supply of these isotopic gas standards was exhausted and NIST discontinued their distribution. The residual gas, cylinders, and manifold assembly were subsequently transferred to an academic research institution, then to a private company, and finally donated to the U.S. Geological Survey (USGS). A round-robin interlaboratory study of select natural gases from China was recently conducted [3] in a presumed effort to replace the NGS gases; however, these new gases were not made available for general use as reference standards.

In response, the USGS initiated a project to develop a new suite of natural gas standards to replace the exhausted supply of NGS gases. This project was a collaborative effort by researchers from academic, governmental, and industrial organizations from around the world. USGS personnel took the lead to administer and coordinate the work related to the development of new standards including: (1) identification of an international technical advisory committee, (2) collection of gas samples, (3) distribution of the gases for calibration and round-robin analyses, (4) compilation and statistical analysis of the calibration data, (5) preparation of a final report, and (6) storage and distribution of the new gas standards. All analytical work related to this project has been completed, carbon and hydrogen isotope values have been assigned, and the gases are ready for distribution. This presentation summarizes the USGS effort to produce and distribute the three new natural gas isotope standards.

[1] G. Hut (1985), IAEA; Vienna, Austria: 16-18 September 1985. [2] Wise and Watters (2007), NIST Report of Investigation RMs 8559-8561. [3] Dai et al. (2012), *Chemical Geology* **310–311**, 49-55.