

Development of Accurate Methane Gas Standards Using an Auto-Balance System

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Abstract

Methane is one of the major greenhouse gases contributing to climate change. As a highly flammable and explosive gas, it is also a safety concern in industrial activities where methane is present in high concentration. To mitigate such potential hazards, detectors are normally deployed in facilities where methane gas is present to give advanced warning should leakage occur, and the concentration of leaked methane gas reaches certain pre-determined threshold. These detectors have to be tested to ensure that they are capable of detecting the intended threshold level, and regularly calibrated as their performance invariably drifts with usage and the passage of time. Testing and calibration of the detectors requires methane gas standards with accurately known concentration values.

This paper describes the development of highly accurate methane gas standards prepared gravimetrically using an Auto-Balance System. The purity of parent gases used for the preparation were analysed by the most sensitive method – Gas Chromatograph with Atomic Emission Detector (GC-AED) – and the prepared gas standards were then analysed using Gas Chromatograph with Flame Ionisation Detector (GC-FID). Major sources of uncertainty in the concentration values assigned to the prepared gas standards were evaluated. The total uncertainties of the concentration values were about 0.02%.