# Chapter 8 The Challenge of Developing Primary Standards Mixtures of Carbon Dioxide at Atmospheric Levels: Establishing Traceability to Ghg Monitoring Analysis

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## ABSTRACT

In recent years, the need for the quality control, reliability, and traceability of analytical results has been strongly emphasized. The National Metrology Institute – Inmetro is involved in improving measurement capabilities to provide confidence level regarding greenhouse gases standards. The chapter describes the development of certified reference materials of carbon dioxide in atmospheric synthetic air that are used to monitor its concentration in the atmosphere. Considering the contributions from gravimetry preparation and its verification analysis by cavity ringdown spectroscopy (CRDS), the relative expanded uncertainty of the standard mixture of carbon dioxide was lower than 0.5% for the range studied from 370 to 550 µmol/mol, which is comparable to the average of 0.25% relative uncertainties presented on international standards mixtures.

## INTRODUCTION

Greenhouse gases, as defined by ISO 14065 Clause 3.1.1, are gaseous constituent of the atmosphere, both natural and anthropogenic, that absorbs and emits radiation at specific wavelengths within the spectrum of infrared radiation emitted by Earth's surface, the atmosphere, and clouds. Include carbon dioxide ( $CO_2$ ), methane ( $CH_4$ ), nitrous oxide ( $N_2O$ ), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF6) (ISO14065, 2013).

It is well known that improved quality and monitoring points in greenhouse gases (GHG) is needed to better predict climate tendencies and monitor sources and sinks of GHG, but also there is the need to increase certainty in achieved values of the mitigation reduction goals of GHG. All of these are presented in the Intended Nationally Determined Contributions (INDC), which is a term used under the United Nations Framework Convention on Climate Change (UNFCCC) for reductions in GHG that all countries that signed the UNFCCC were asked to publish in the lead up to held in Paris (United Nations, FCCC, 2015).

Implementing efficient provisions in order to protect biodiversity and to act against climate change requires an effective and efficient, demand-oriented quality infrastructure (QI). In order to support the transition process towards a "green economy", there is a need to focus on three key areas regarding environment: study of ISO standards and development of standards, improvement of the metrological system, and validation programs, verification and certification. Regional research laboratories worldwide will benefit from reliable, accredited measurement and testing capacities which have to be provided to ensure sustainable management. 24 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igiglobal.com/chapter/the-challenge-of-developing-primarystandards-mixtures-of-carbon-dioxide-at-atmosphericlevels/217768

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