

## IAEA reference materials for quality assurance of marine radioactivity measurements

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The IAEA's Marine Environment Laboratory has been assisting laboratories in Analytical Quality Control Services (AQCS) for the analysis of radionuclides in the marine environment since the early seventies. AQCS through world-wide and regional intercomparison exercises and the provision of reference methods and reference materials (RM) have been recognized as an important component of quality assurance/quality control. A total of 43 intercomparison exercises were organized and 37 RM were produced for marine radioactivity studies. All important marine matrices were covered: e.g. seawater, marine sediments of different chemical compositions, fish, shellfish and sea-plants. RM were prepared from samples collected at contaminated sites (e.g., the Irish Sea, the Baltic Sea, the Arabian Sea, Mururoa and Bikini Atolls, etc.) as well as from sites affected only by global fallout (e.g., the Pacific Ocean). Available RM are listed in the IAEA biennial catalogue and can be purchased at a minimal price. An overview of prepared RM for radionuclides in marine matrices is presented and discussed in more detail.

### Introduction

The International Atomic Energy Agency's Marine Environment Laboratory (IAEA-MEL) has been assisting laboratories in Member States (MS) in Analytical Quality Control Services (AQCS) in marine radioactivity studies for about 30 years. AQCS through world-wide and regional intercomparison exercises and the provision of reference materials (RM) has been recognised as an important component of the IAEA's programme. In the early years, the AQCS programme concentrated on radionuclides<sup>1</sup> and later on multielemental compositions and organic compounds as well.<sup>2</sup>

Following many years of experience in the AQCS programme and the recent recognition of the great importance of environmental data in economic, ecological and legal decision-making, the IAEA-MEL has been reviewing whether further steps should be taken to assist MS in improving data quality. In particular, it has been proposed<sup>3</sup> that the AQCS programme should address in full the complex problem of the total quality management of analytical laboratories, including in-house harmonisation of the AQCS programme, quality assurance (QA) programmes and manuals, intercomparison exercises with proper feedback, development of reference methods, production of certified reference materials (CRM), accreditation of the Agency's and MS' laboratories and training in quality assessment and control.

The objectives of the IAEA's AQCS programme can be summarised as follows:<sup>3</sup> (1) to assist MS in Quality Assurance/Quality Control (QA/QC) programmes through the organisation of world-wide and regional intercomparison exercises, (2) to provide MS with feedback information on the performance of their

laboratories and to organise evaluation meetings, and AQCS missions to improve their performance, (3) to assist MS with the development of QA programmes and manuals, (4) to provide MS with analytical reference methods, (5) to establish the analytical competence and methods needed to produce CRM, (6) to provide MS with RM and CRM in types and quantities sufficient to serve their needs, and (7) to organise training in QA/QC.

A total of 43 intercomparison exercises were organised and 37 reference materials were produced for radionuclides in the marine environment. Over two hundred fellows took part in training organised by IAEA-MEL.

In the present paper we present an overview of IAEA reference materials for marine radioactivity studies and discuss experiences gathered in the preparation of a recent CRM, IAEA-381 (Irish Sea water).

### Reference materials

RM represent samples of well established properties used for the assessment of analytical methods. More rigorous materials, certified reference materials (CRM) or standard reference materials (issued by the National Institute of Standards and Technology – NIST, USA) have property values certified by technically valid procedures (at least with two independent methods) traceable to SI units.<sup>4,5</sup>

RM and CRM have great impact on the development of methods of known accuracy. They represent important benchmarks in QA, identifying weak methodologies, detecting training needs, up-grading the quality of laboratories' performances and assessing the validity of analytical methods. The reference methods (or international standard methods) can only be accepted on the basis of interlaboratory tests performed on selected CRM.

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