Potential European Partnership on Metrology
Call 2021 – Green Deal and Normative

Selected Research Topic number: **SRT-v06**
Version: 1.1

Important information about these documents

This call is being held ahead of any agreement from the Commission that the relevant funding will be available. At present the relevant legislation is still under discussion in both Council and Parliament, and there is no certainty on the detailed arrangements for funding selected projects. The funding of any selected project, and the terms and conditions of participation in the projects, are dependent on completion of the legislative process and the subsequent contractual processes between the European Commission and EURAMET. Proposers submit to this call at their own risk.

Background

Last year, EURAMET submitted a draft proposal to the EC for a further research programme to be established under article 185 of the Treaty on the Functioning of the European Union (TFEU) to follow on from EMRP and EMPIR. This was published by the EC at https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/european-partnerships-horizon-europe/candidates-digital-industry-and-space_en

The initiative would be called the European Partnership on Metrology and would aim to create, by 2030, a sustainable and effective system for metrology at European level that ensures Europe has a world-class metrology system that:

- Provides metrology solutions, fundamental metrological reference data and methods, offering fit-for-purpose solutions supporting and stimulating European innovation and responding to societal challenges.
- Supports and enables effective design and implementation of regulation and standards that underpin public policies that address societal challenges.

The Commission commissioned an impact assessment into this proposal and 11 others in similar priority areas, and, based on those findings, published their own proposal for the Partnership, their response to the impact assessment and a draft of the Decision on 23rd February 2021. See:

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2021:89:FIN

https://ec.europa.eu/commission/presscorner/detail/en/ip_21_702

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021SC0035&qid=1614677899327

That draft Decision is currently under discussion in the European Council and the European Parliament.

Under the assumption that the Council and Parliament pass the basic act which would form the legal basis for this research programme, and that the participating countries named in the Draft Decision submit the required commitment letters, EURAMET is publishing these potential Selected Research Topics and draft guidance notes. These documents are not approved by the Commission nor will they lead to a binding decision by EURAMET e.V. for any further negotiation or funding. All published guides and templates are subject to amendment by the EC and EURAMET e.V. as further information becomes known.

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Title: Metrological traceability of measurement data from nano to small-microplastics for a greener environment and food safety

Abstract

Plastic contamination is recognised worldwide as a severe anthropogenic issue. The current global annual production of plastics exceeds 359 million tonnes; approximately two-thirds of which ends up in the environment as plastic debris. To try and tackle this issue the European Commission adopted the new circular economy action plan (CEAP) in March 2020. The CEAP promotes circular economy processes, encourages sustainable consumption, and aims to ensure that waste is prevented. However, in order to support the CEAP and reduce plastic contamination, methods for the identification, characterisation and quantification of small microplastics (SMPs) and nano-plastics (NPs) in food and environmental matrices are needed. Such methods need to be metrologically validated using appropriate reference materials, so that Europe can establish harmonised and traceable measurements of SMPs and NPs.

Keywords

Microplastics (MP), small-microplastics (SMP), nano-plastics (NP), circular economy action plan (CEAP), drinking water, environmental pollution, food safety, reference materials

Background to the Metrological Challenges

After release into the environment, plastic debris can experience complex physico-chemical transformation processes such as aging, degradation, aggregation and fragmentation. The fragmentation of larger plastic materials produces MPs (0.1 µm - 5 mm) and subsequently NPs (1 - 100 nm; ISO/TS 80004-1:2015). Due to their smaller dimensions and colloidal properties, SMPs/NPs (0.1 - 100 µm / 1 - 100 nm) are more likely to cross biological barriers, increasing the potential for accumulation and the risk of negative health effects. Indeed, SMPs have been detected in a wide range of environmental matrices, including fresh water, seawater, soil, sewage and biota; and MPs have been detected in food products such as honey, table salt, milk and seafood.

In the last decade, several studies have reported on the occurrence, analytical methods and toxicity of MPs in the environment and food matrices, however research on MPs that are less than 100 µm in size has been overlooked, primarily due to the methodological challenges associated with SMPs/NPs. SMPs/NPs samples in the environment or food chain are extremely complex and predominantly composed of hydrocarbon polymers. This makes it very tricky to isolate and detect them in environmental and food matrices, which are already rich in carbon-based components. Further to this, nearly all previous studies on SMPs/NPs have been based on commercially available polyethylene or polystyrene particles that are monodispersed, spherical and coated with toxic surfactants and stabilisers. In contrast, SMPs/NPs are polydispersed and have undefined morphologies, and hence truly representative reference materials for SMPs/NPs are urgently needed.

Plastic debris comes in a huge range of sizes, polymer types, levels of physicochemical degradation and associated chemicals, therefore a combination of different sampling, sample processing and analytical techniques is needed. To date, a variety of methods have been used to try and quantify SMPs/NPs (e.g. field flow fractionation, chromatography; dynamic light scattering, nanoparticle tracking analysis, atomic force microscopy, scanning electron microscopy, microRaman spectroscopy and single particle-inductively coupled plasma mass spectrometry), but although these techniques have potential (alone or in combination), there is still a lack of traceable methods for SMP/NP measurement and characterisation. This issue is predominantly due to (i) the inability to readily distinguish plastic SMP/NP from other types of particles in the same size range, (ii) the analytical challenges of pre-concentrating samples to meet the detection limits for the identification of SMPs/NPs in real samples, and (iii) the reduction of interference due to dissolved and particulate organic matter. Thus, these issues need to be addressed and accurate and reliable sampling, extraction, purification, and identification methods developed for SMPs/NPs in food and environmental matrices.

Objectives

Proposers should address the objectives stated below, which are based on the PRT submissions. Proposers may identify amendments to the objectives or choose to address a subset of them in order to maximise the overall impact, or address budgetary or scientific / technical constraints, but the reasons for this should be clearly stated in the protocol.

The JRP shall focus on the traceable measurement and characterisation of SMPs and NPs in drinking water, food and environmental matrices.

The specific objectives are

1. To develop reference materials and associated traceable methods for measuring SMPs (0.1 µm - 100 µm) and NPs (<0.1 µm) in complex matrices. The SMP/NP reference materials should be representative of partially degraded/naturally aged samples and have realistic polydisperse size distributions and irregular shapes.
2. To develop accurate and efficient sample preparation methods for the measurement of SMPs and NPs in complex food and environmental matrices (e.g. surface water, raw material, packed food). Such methods should include (i) enrichment prior to analysis, (ii) selective removal of natural background organic/inorganic matter, (iii) size fractionation/isolation, and (iv) homogenisation and partition steps. The sample preparation methods must also demonstrate a negligible effect on the particle characteristics and polymer compositions of samples.
3. To develop accurate and robust methods for the characterisation of (i) chemical content of the SMPs/NPs polymeric composition; (ii) physical particle characterisation and quantification, size distribution and particle morphologies; and (iii) quantification of the mass fraction in complex matrices.
4. To demonstrate the validity and applicability of the methods and reference materials developed in Objectives 1-3 via an inter-laboratory comparison. As part of the comparison best practice guidance on the traceable measurement and characterisation of SMPs and NPs in food and environmental matrices should be developed.
5. To facilitate the take up of the technology and measurement infrastructure developed in the project by the measurement supply chain, appropriate EURAMET's European Metrology Networks, relevant associations outside of Europe (e.g. National Nanotechnology Initiative USA), standards developing organisations (e.g. ISO TC 229, ISO TC 61, CEN TC 249 and those associated with the Urban Waste Water Treatment Directive (91/271/EU), the Marine Strategy Framework Directive (2008/56/EC) and the Drinking Water Directive (EU) 2020/2184) and end users (e.g. food and drink producers, environmental monitoring programmes and health experts).

These objectives will require large-scale approaches that are beyond the capabilities of single National Metrology Institutes and Designated Institutes. To enhance the impact of the research, the involvement of the appropriate user community such as industry, standardisation and regulatory bodies is strongly recommended, both prior to and during methodology development.

Proposers should establish the current state of the art, and explain how their proposed project goes beyond this. In particular, proposers should outline the achievements of the European Strategy Forum on Research Infrastructures (ESFRI) METROFOOD-RI, EU projects PlasticsFatE (ID: 965367), POLYRISK (ID: 964766), EUROqCHARM (ID: 101003805) and the EMPIR projects 20NET03 POLMO and 20NET02 FoodMetNet, and how their proposal will build on those.

EURAMET expects the average EU Contribution for the selected JRPs in this TP to be 2.2 M€, and has defined an upper limit of 2.7 M€ for this project.

EURAMET also expects the EU Contribution to the external funded partners to not exceed 35 % of the total EU Contribution across all selected projects in this TP.

Potential Impact

Proposals must demonstrate adequate and appropriate participation/links to the "end user" community, describing how the project partners will engage with relevant communities during the project to facilitate knowledge transfer and accelerate the uptake of project outputs. Evidence of support from the "end user" community (e.g. letters of support) is also encouraged.

You should detail how your JRP results are going to:

- Address the SRT objectives and deliver solutions to the documented needs,
- Feed into the development of urgent documentary standards through appropriate standards and regulatory bodies,
- Transfer knowledge to the manufacturing, environmental, health and food sectors.

You should detail other impacts of your proposed JRP as specified in the document "Guide 4: Writing Joint Research Projects (JRPs)"

You should also detail how your approach to realising the objectives will further the aim of the potential European Partnership on Metrology to develop a coherent approach at the European level in the field of metrology and include the best available contributions from across the metrology community. Specifically, the opportunities for:

- improvement of the efficiency of use of available resources to better meet metrological needs and to assure the traceability of national standards
- the metrology capacity of EURAMET Member States whose metrology programmes are at an early stage of development to be increased
- organisations other than NMIs and DIs to be involved in the work.

Time-scale

The project should be of up to 3 years duration.