

Preparation of nanoparticle suspension by indirect probe sonication

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Version

1.0 English

Content

1	Scope	2
2	Basics	2
3	Materials & Instruments	2
	3.1 Materials	2
	3.2 Instruments	2
4	Experimental procedure	3
	4.1 Stock Suspension preparation	3
	4.2 Suspension preparation - spiking	4
5	Safety precautions	4
6	Waste disposal	4

1 Scope

This Standard Operating Procedure (SOP) describes the nanomaterial suspension preparation within the nanoGRAVUR Project by using indirect probe sonication with a Cup Horn.

2 Basics

Bringing nanoparticles into suspension is always a challenge and several different protocols are currently used in different scientific studies. However, a dispersion procedure often has to be adapted to the specific material, experiments especially if several, parallel investigations are planned. Consequently, there is not a unique procedure to be applied, only a compromise of the minimal common base, acceptable for the different investigations.

The aim of this Standard Operating Procedure is the description of the in this project applied suspension procedure. The procedure was tested and applied during the EU SIINN Project nanOxiMet and UBA Project FKZ: 3714 67 417 0.

In this project the procedure is applied for all materials irrespectively their "ideal" dispersion by this procedures (e. g. high agglomerate status is accepted).

In the follow the SOP describes suitable steps for preparing a nanoparticle suspension in this project.

Stability criteria are e.g.

- Optical observation (no visible sedimentation of the particles)
- Size of the particles in the suspension
- Zeta potential

3 Materials & Instruments

3.1 Materials

The following materials and chemicals are required:

- HPLC Grade water (CAS 7732-18-5)
- Nanomaterial (solid/powder/suspension)
- Clean Spatula
- Pipette

3.2 Instruments

Comparable equipment as the mentioned instrument is required:

- Ultrasonication equipment (Bandelin Sonoplus HD2200 ultrasonic homogenizer 200 Watt, Bandelin Cup Horn BB6)

Note: The usage and maintenance of the instruments will be not described in this SOP. Please refer to the manual.

4 Experimental procedure

4.1 Stock Suspension preparation

For preparing the nanomaterial suspension HPLC Gradient Grade Water is used – CAS 7732-18-5

- a defined amount of the nanomaterial – here 40 mg – is weighed in a 50 ml plastic centrifuge vial (a variance of 1% is accepted)
- each of the centrifuge vial is filled up to 40 ml (concentration 1 mg/mL) with HPLC Water creating a stock suspension
- the centrifuge vial is placed in the middle of the Cup Horn. The bottom of the centrifuge vial is placed 1 cm above the sonication unit (s. Figure 1)
- the Cup Horn is filled with 230 mL deionised water
- the suspension is sonicated in the Cup Horn for 10 minutes in sum (2 min effective), with a pulsation pause ratio of 0.2/0.8 (Bandeline Sonoplus HD 2200 or comparable instruments)
- for sonication the vial with the suspension is cooled with cold/ice water in the Cup Horn to minimize the heating of the suspension during the sonication

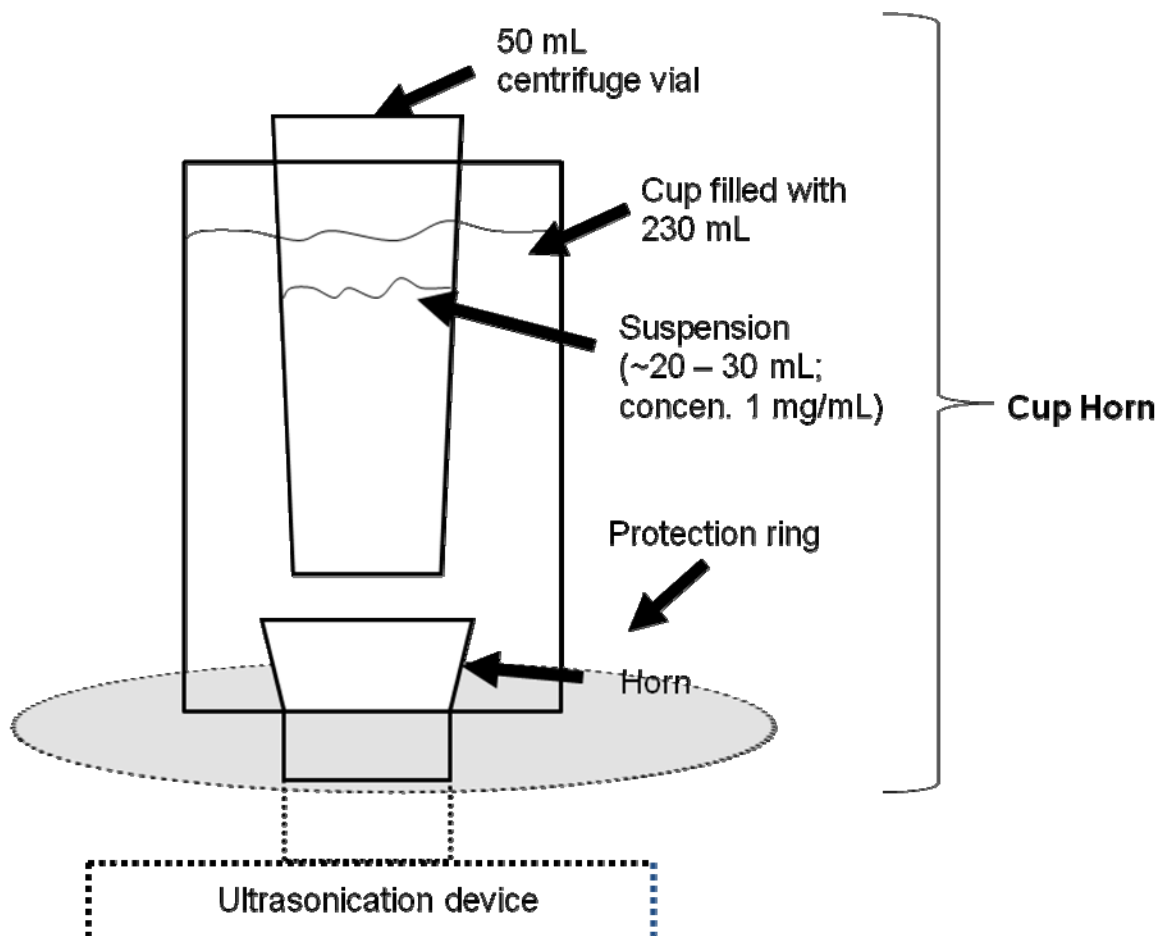


Figure 1. Scheme of the experimental setup (here for Bandelin Cup Horn BB6)

4.2 Suspension preparation - spiking

Directly after sonication the stock suspension is shaken by hand, three times. Afterwards a defined amount of the stock suspension is directly pipetted to the test samples to reach the target concentration in the test system.

5 Safety precautions

Please follow the safety information and regulations of the working laboratory as well of the materials provider. In general handle with care, wear protective clothing and suitable gloves at any time and labeling the material.

6 Waste disposal

Please follow the disposal advice of the material provider, if available.

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Signature/Date

Author: _____,
Dr. rer. nat. C. Nickel

Reviewed: _____,
Dr. rer. nat. B. Hellack

Approved: _____,
PD Dr. rer. nat. habil. T. Kuhlbusch