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OPERATING INSTRUCTIONS

According to Betriebs-sicherheitsverordnung

UNIVERSITÄT
DUISBURG
ESSEN

Offen im Denken
Faculty of Chemistry

Institute: AAC

Work place: AAC Labs

Activity: Laboratory work

EQUIPMENT

CEM Mikrowelle Mars 6

DANGERS FOR HUMANS AND ENVIRONMENT



- Microwave radiation
- High pressure

PROTECTIVE MEASURES AND RULES OF CONDUCT



- Never install the device inside a fume hood. Acid vapors and other chemical vapors attack the electrical components, possibly resulting in damage or malfunction of the interior door safety interlock.
- This instrument uses high voltage and microwave radiation during operation. Service and repair may only be carried out by trained personnel.
- If the Mars 6 Microwave is equipped with a stirrer, there is a potential risk to people with pacemakers if the wearer is near the instrument's door.
- The Mars 6 microwave should not be placed near devices that are susceptible to electromagnetic radiation.
- The maximum allowable surface leakage level for this device is 5mW / cm², which must be checked at certain intervals by a micro-cell leakage test. Here, a method "leakage test" is created in which you place a cup with 100mL of water on the turntable.
- The following parameters are used:
 - Power: 1800 W (100%)
 - Heating up time: 2 minutes
 - Pressure: 0 bar
 - Temperature: 240 ° C

- Stirrer off
- Hold time: 0

- Use a suitable microwave leakage meter and slowly move the RF probe over the door, edges and corners to check for microwave leakage.
- When used daily, remove the ESP-1500 PLUS hose connection and thoroughly clean the connector with a paper or soft cloth. Wipe and clean the inside and outside of the connector. If necessary, moisten the cloth with isopropyl alcohol to aid in cleaning.
- If the Mars 6 microwave is equipped with IR sensors, each IR window or lens should be cleaned weekly and after each spill of liquid with a damp, soft cloth.
- Do not use abrasive cleaners as they may scratch the fluoropolymer interior shell and reduce its ability to resist corrosion.
- When cleaning the exhaust hose, wear rubber gloves as condensed acid may collect in the hose.
- Never insert metallic objects (such as wires) into terminals, and never modify them, as this can result in electrical shock.
- Never heat liquids in a closed vessel without pressure equalization unit.
- Only use the containers approved for the device and specified in the methods; all others lead to incalculable risks.
- All reaction vessel components must be dry and free of particles. Drops of liquid or particles absorb microwave energy, cause local heating, and may damage vessel components leading to potential vessel failures.
- Persons must take appropriate precautions to avoid contact with reagents or their vapors. Suitable protective clothing such as acid protection gloves and respiratory masks should be worn in these cases.
- Never digest more than 0.5g sample if the composition and organic content are not known. It is with max. 0.1g to start and, if necessary increase in 0.05 to 0.1g increments.

- Unknown samples should be treated for a minimum of 15 to 30 minutes in an open vessel (with a loose lid to prevent contamination) without heat, before starting to digest in a closed vessel in the microwave.
- The amount of acid or water used depends on the application: As a (total) minimum volume (sum of all used vessels) for the digestion must not fall below 10mL of acid or 50mL of water.
- The heating of bases or saline solutions in open or closed vessels concentrates these solutions and causes residues of salt and crystals on the walls of the vessel when the amount of liquid used is too small to resume the deposited salts upon reflux within the vessel. These residues absorb microwave energy and cause local heating (overheating), which can damage the vessels and their possible total failure.
- It is advisable to use an application-dependent cooling time for each digestion carried out in the Mars 6, in order to avoid the risk of burns or splashing of the acid / solvent when opening. Depending on the application, the minimum time before opening the vessels is 10-20 minutes. Acid digestions must be cooled to well below 50 ° C (HF below 30 ° C) before they can be removed from the microwave and opened. For HF, special protection regulations for HF handling are to be observed. **The approval of the head of the department (Prof. Schmitz) must be obtained in advance. Without this, working with HF is strictly prohibited.** HF digests should only be carried out by specially trained personnel and the area of the laboratory where the microwave oven is located is closed to other people during the time of working with HF.
- The following types of compounds are unsuitable for microwave digestions because they react and / or nitrate with oxidizing acids in a highly reactive manner and could potentially become explosive:
 - Explosives (TNT, nitrocellulose ...)
 - propellant (hydrazines, ammonium perchlorates ...)
 - Pyrophoric chemicals
 - Hyperbolic mixtures (nitric acid and phenol, nitric acid and triethylamine ...)

- nitrable animal fats
- acetylidene
- Glycols (ethylene-glycol, propylene-glycol ...)
- perchlorates
- ether
- varnish
- alkanes
- ketones (acetone, methyl ethyl ketone ...)
- Alcohols (methanol, ethanol ...)

Take special care with the following commonly used chemicals:

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| Perchloric acid | Explosive, especially the salts, splits off chlorine, causes severe burns, flush with water on contact with eyes / skin |
| Sulfuric acid | Dehydrates other substances, causing severe burns, rinse with water on contact with eyes / skin, do not induce vomiting if swallowed |
| Hydrofluoric acid - requires separate approval and instruction | Life-threatening injuries on contact with the skin, ingestion or inhalation attacks the nervous system, causing severe chemical burns |
| Aqua regia | Nitrosyl chloride is harmful to health, causes severe burns, promotes fires |
| Nitric acid | Causes severe burns, promotes fires, flush with water on contact with eyes / skin |
| NaOH/KOH/ LiOH | Extremely active in the microwave, cause severe chemical burns, sometimes toxic if swallowed, flush with water on contact with eyes / skin, do not induce vomiting if swallowed |

| | |
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| Hydrogen peroxide | Strong oxidizing, harmful by inhalation / ingestion, causes severe burns, flush with water in contact with eyes / skin |
| Ether | Explosive, harmful if swallowed, may cause drowsiness and dizziness |
| Org. solvents | Toxicity, Explosive, Flammable, Volatility |

RESPONSE TO MALFUNCTIONS



- Shut down device immediately, faults must be reported to: Maria Madani, if not present O. Schmitz, M. Sulkowski, F.Uteschil, S. Meckelmann.

VERHALTEN BEI UNFÄLLEN/ERSTE HILFE



- Keep calm.
- Call first responders.
- Emergency call: 0112
- Report accident.

MAINTENANCE / DISPOSAL

- Maintenance only by authorized, competent persons.
- Switch off the device and disconnect it from the mains.
- Regular inspection of wearing parts.