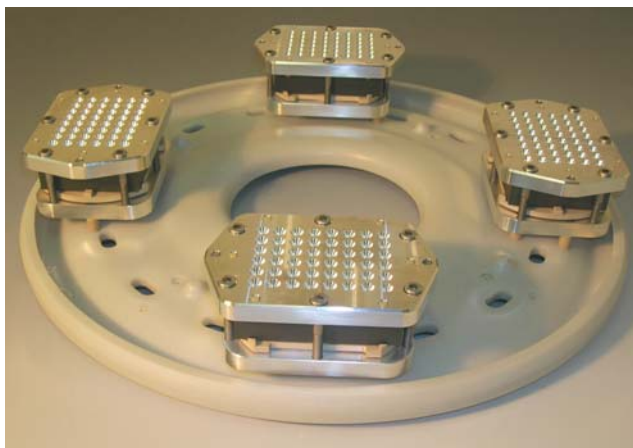


Rotor 4x48MC Well Plate



The unique, sealable SiC well plates with 6×8 matrix are a special accessory to enable initial screening reactions. Reaction conditions up to 200 °C and 20 bar can be accessed for the first time utilizing a microtiter plate format. The excellent microwave-absorbing silicon carbide (SiC) allows even heating of non-polar, weak-absorbing solvents and reagents in the microwave field. With the Rotor 4×48MC Well Plate up to four of those units can be processed at a time.

With the growing numbers of microwave instruments used in chemistry labs, performing microwave-mediated screening reactions in the initial stage of method development becomes of increasing interest. As many microwave-assisted reactions proceed favorably under high temperature/high pressure conditions it would be appreciable to have identical conditions available already in the very first step of method development, which can be applied without further modifications during the following scaling-up steps. Usually, most microwave-assisted reactions in sealed vessels are performed in a range up to 20 bar and 250 °C, according to the limits of commercially available single-mode reactors.

However, for reactions in a well plate format such conditions have not been applicable so far. Thus, method development of valuable compounds could not be performed under identical microwave conditions as the subsequent processes. With this new accessory it is possible for the first time to run micro-scale reactions under sealed vessel conditions employing a standard microtiter plate format in the identical microwave environment where even kg production of compounds can be achieved.

To attain this purpose successfully, we utilize a silicon carbide (SiC) well plate with standardized 6×8 matrix. This well plate is equipped with a

unique, patented all-metal sealing mechanism to enable the applications at elevated pressure. Reaction control is achieved by IR sensing of the bottom surface of the SiC plate. Due to the excellent heat capacity of the silicon carbide temperature uniformity over all positions is guaranteed.

For proper admixing, tiny stir bars can be applied in each well.

After processing, samples can be withdrawn by simple perforation of the PFA septum with a syringe.

Benefits

- Inert and stable well plate material
- Utmost heat uniformity for a well plate in a microwave field
- No contamination of reaction products
- Unique sealing mechanism for reactions at elevated pressure
- Efficient application of non-polar solvents under microwave irradiation
- Unlimited re-use of the SiC well plate
- Smart & compact design for use in other standard lab instrumentation

Fields of Applications

- Method development
- Reaction optimization/screening
- Combinatorial chemistry

The Rotor 4x48MC Well Plate allows effectively initial microwave-mediated screening reactions in well plate format under reaction conditions similar to other microwave equipment. This enables consecutive processing without changing of parameters from micro-scale reactions up to molar amounts in one microwave system.

As silicon carbide interacts extremely well with microwaves even non-polar solvents and reagents can be applied effectively. Those materials will be heated not directly by microwave irradiation but by contact with the hot SiC plate. Due to the excellent heat capacity and the small volumes applied the heating is as fast as pure microwave heating itself.

Thus, completely new pathways for conducting microwave-mediated reactions can be investigated as a variety of solvents can be employed under enhanced microwave conditions for the first time.

Set Up & Handling

To accomplish sufficient sealing, the microtiter plate setup consists of several parts (see Fig. 1). The SiC well plate (a) is placed on an aluminum base plate (b), covered with a disposable PFA foil (c) and closed with the perforated aluminum top plate (d). Hand-tight fixing of six Allen screws (e) ensures tightness up to 20 bar.

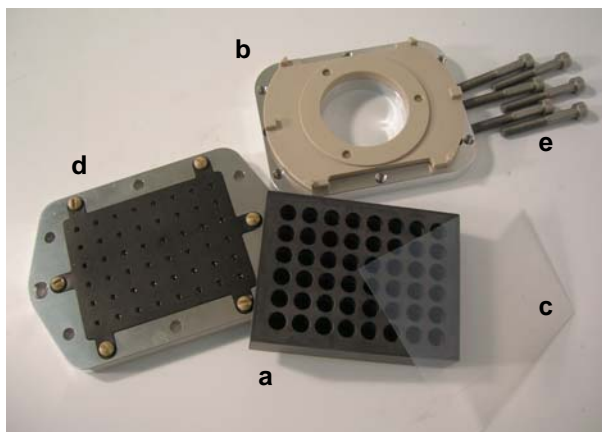


Fig. 1. Assembly for sealing the well plates

Besides the circular opening for IR sensing the base plate has three additional bore holes for proper positioning on the corresponding bolts of the rotor plate. For safety reasons and to achieve rapid cooling the assembled rotor is covered by a protection lid.

To simplify accurate positioning of all the components, the base and top plate are equipped with appropriate guiding bolts. Thus, the SiC well plate rests correctly on the base and the top plate can be placed straight on the well plate. Crosswise fixing of the six screws with an Allen key ensures plain sealing without any torsion. The assembled unit is shown on Fig. 2, a detailed description of the set-up is presented in the brief instruction manual (C49IB09).



Fig. 2. Assembled Well Plate

Limitations

The used plate material is a sintered silicon carbide ceramic, which is extremely stable and inert over a wide temperature range. Thus it could be heated up to several hundred °C without any problems. However, there are restrictions on the other materials used as the PEEK spacer, the PFA foil, and the utilized Viton® sealing mat (fixed on the underside of the top plate, see Fig. 1d) have some temperature limitations. To avoid any deformation or melting of these materials the operation limit of the system is 200 °C.

Employed in this temperature range, silicon carbide remains absolutely inert and does not interfere with the reagents applied. No contamination occurs, products can be achieved in satisfying purity. The Viton® mat in combination with the PFA foil ensures individual sealing of each well and no cross contamination between the individual wells can be observed.



Product Information

As there is no active pressure sensing in the system the resulting pressure has to be calculated according to the vapor pressure diagrams of the employed solvents. An applied temperature of 200 °C would lead to pressures significantly higher than 20 bar for some low boiling solvents like methanol or ethanol. Care has to be taken when using such solvents not to exceed the recommended limits. The system is tested up to 20 bar and 200 °C, up to these values the system is tight and safe to use. For a comprehensive discussion regarding application limits of various solvents see the corresponding instruction manual (C49IB09).

Due to the excellent heat capacity of the silicon carbide the temperature is identical over the whole plate. However, since the surface temperature is somewhat lower than the inside temperature, this has to be considered upon method development. For the SiC plates a constant correlation factor (f_c) has been determined, which allows to estimate the current reaction temperature from the measured IR value. Multiplying the displayed IR temperature with $f_c = 1.112$ gives the actual reaction temperature inside the wells (see table).

Preset IR Limit	Reaction Temp.
120 °C	134 °C
135 °C	150 °C
150 °C	167 °C
180 °C	198 °C

Thus, the maximum applicable IR limit allowed is 180 °C, corresponding nicely with a desired reaction temperature of 200 °C.

For details on the estimation of the correlation factor f_c refer to the respective instruction manual (C49IB09).

Note: Software v2.0 or higher is required to operate Rotor 4x48MC Well Plate.

Ordering Information

40421 Rotor 4x48MC Well Plate

Fully equipped rotor with rotor plate and protection lid, comprising 4 units of assembled well plates (Mat. No. 41217) and 40 PFA foils (Mat. No. 41020) for sealing and an Allen key.

41216 Rotor 4x48MC

Rotor plate with corresponding protection lid. Well plates (Mat. No. 41217) and other accessories not included.

41217 Well Plate 48MC assembled

Complete well plate unit, comprising the aluminum sealing assembly, the silicon carbide well plate (Mat. No. 41021) and the sealing PFA foil (Mat. No. 41020).

41021 Well Plate 48MC

Microtiter well plate made of silicon carbide (SiC) with 300 µL wells in a 6x8 matrix

41020 Sealing Foil 48MC

Package of 10 appropriate fitting PFA foils (0.3 mm), used as disposable septum in the well plate assembly (Mat. No. 41217)

41025 PEEK centering 48MC

PEEK spacer used in the well plate assembly for correct positioning of the SiC well plate (Mat. No. 41021) on the aluminum base plate.

41019 Inlay 48MC

Perforated fluoropolymer mat (Viton®) supporting proper sealing of the SiC well plate, fixed on the aluminum top plate of the sealing assembly.

41024 Knop 48 MC

PEEK bolt for fixing the inlay (Mat. No. 41019) on the aluminum top plate of the sealing assembly.

41015 Bolt long 4x48 MC

PEEK bolt mounted near the outer rim of the rotor plate for appropriate positioning of the aluminum sealing assembly (Mat. No. 41217).



41017 Bolt short 4x48 MC

PEEK bolt mounted near the inner rim of the rotor plate for appropriate positioning of the well plate assembly (Mat. No. 41217).

41018 Bolt 4x48 MC

PEEK bolt mounted on the outside edge of the rotor plate, used as the bayonet lock for the rotor lid.