Technical specification, performance and applications of the

TWR 3000 advanced system

The TWR 3000 advanced system is consisting of:

- TWR 3000 advanced – GEN (Microwave Radical Generator)
- TWR 3000 advanced – PS (Power Supply)

1. Description of system

The TWR 3000 advanced series is designed for the usage at vacuum chambers. Typical process pressures are between 0.3 Torr and 5.0 Torr.

The TWR 3000 advanced – GEN is a Remote Plasma Source (RPS), describing the fact that a plasma is only generated and existing in the RPS itself, not in the process chamber.

No plasma, only radicals are reaching the process chamber. Therefore the TWR 3000 advanced system is ideal for applications which necessarily need to avoid physical effects as ion bombardment and high thermal load.

The radicals generated by the Remote Plasma Source are creating only a chemical reaction at the surface of the substrates. That is leading to extremely low thermal load and damage free etching at high rates.

R3T GmbH, Rapid Reactive Radicals Technology
Hochstr. 1, D-82024 Taufkirchen
Tel.: +49 89 4111 859 00
Fax: +49 89 4111 859 80

Geschäftsführer: Dr. Alexander Mattheus, Klaus J. Muegge
Registergericht München HRB: 122 226
UST-Id-Nr.: DE 812532055 St.-Nr.: 143/174/40341
Hypo-Vereinsbank München BLZ: 700 202 70 Kto.-Nr.: 39 990 040

2. Applications

The TWR 3000 advanced system has superior qualities for chamber clean, isotropic etching, resist stripping, surface modification and back end applications.

Chamber Clean

Process pressures as low as 0.3 Torr are leading to excellent results for cleaning of process chambers with complex geometry due to the very high mobility of the radicals in the low pressure regime.
Recently the system has been qualified for the usage of F_2 which enables extended chamber cleaning applications especially if customers want to avoid greenhouse gases as SF_6, NF_3 and Perfluorocarbons (PFC's as e.g. CF_4).

Etch rates (isotropic etching):

- More than 20 µ/min for SU-8 samples
- Up to 90 µm/min for silicon samples
- More than 10 µm/min for 8" silicon wafers
- Up to 10µm/min for photo resist ashing on 300mm wafers
- SiN and BPSG typical 1µm/min
- Thermal Oxide typical 250nm/min
- Tungsten: approx. 1µm/min on 300mm wafers

using the following process gases among others:

a) reactive: CF_4, SF_6, NF_3, O_2, H_2 , F_2
b) inert: N_2, Ar, He

Surface modification
Oxidation and Nitridation of silicon surfaces

Back end applications:
For stress relief after grinding etch rates of 3,5µm/min at a homogeneity of 5% are achieved on 8" wafers

R3T GmbH, Rapid Reactive Radicals Technology
Hochstr. 1, D-82024 Taufkirchen
Tel.: +49 89 4111 859 00
Fax: +49 89 4111 859 80

Geschäftsführer: Dr. Alexander Mattheus, Klaus J. Muegge
Registergericht München HRB: 122 226
UST-Id-Nr.: DE 812532055 St.-Nr.: 143/174/40341
Hypo-Vereinsbank München BLZ: 700 202 70 Kto.-Nr.: 39 990 040

3. Specification

3.1 Dimensions

a) Microwave Radical Generator TWR 3000 advanced – GEN
450mm x 250mm x 250mm

b) Power Supply TWR 3000–PS (19” rack, 3HE)
670mm x 500mm x 135mm (including handholds and connectors)

3.2 Weights

a) Microwave Radical Generator TWR 3000 advanced – GEN
Approx. 24,5 kg (standard - configuration)

b) Power Supply TWR 3000 advanced – PS
Approx. 15,5 kg

3.3 Electrical Specifications

a) Microwave Radical Generator TWR 3000 advanced – GEN
Output Magnetron: max. 3000 Watt con. @ 2,45GHz

b) Power Supply TWR 3000 advanced – PS

Input voltage:	3 x 400 V AC +/- 10%; 3 phases,
Power Frequency:	50 – 60 Hz
Input Current at 400V:	< 10A / phase

3.4 Cooling water /air

a) Microwave Radical Generator TWR 3000 advanced – GEN (water cooled)

Flow	min.: 3 l/min.
Forward flow temp.	min.: ambient temperature, max.: 30°C
Forward flow pressure	min.: 3 bar
Conductance	150 - 250 µS/cm
Water hardness	4,0 - 6,0° dH
pH-value	6,5 - 8,0
Anti-corrosion fluid	> 50 mg/l
Water filtration	20 µm

b) Power Supply TWR 3000 advanced – PS (water cooled)

Flow	min.: 3 l/min.
Forward flow temp.	min.: ambient temperature, max.: 30°C

R3T GmbH, Rapid Reactive Radicals Technology
Hochstr. 1, D-82024 Taufkirchen
Tel.: +49 89 4111 859 00
Fax: +49 89 4111 859 80

Geschäftsführer: Dr. Alexander Mattheus, Klaus J. Muegge
Registergericht München HRB: 122 226
UST-Id-Nr.: DE 812532055 St.-Nr.: 143/174/40341
Hypo-Vereinsbank München BLZ: 700 202 70 Kto.-Nr.: 39 990 040

3.5 Range of operation

Pressure	0,5 Torr – 5,0 Torr *)
Process gas flow	typical 500 sccm – 10 slm *)

*) extendable on request

4. Adaptation and Process optimization

Etch rates and deposition rates are depending strongly on the process chamber design and the process parameters as pressure, flow, temperature, process gases etc.
On request R3T will support customers to optimize their process and chamber design parameters using R3T´s facility and equipment.
Adaptation to customer specified boundary conditions can be performed very flexible.

R3T GmbH, Rapid Reactive Radicals Technology
Hochstr. 1, D-82024 Taufkirchen
Tel.: +49 89 4111 859 00
Fax: +49 89 4111 859 80
Geschäftsführer: Dr. Alexander Mattheus, Klaus J. Muegge
Registergericht München HRB: 122 226
UST-Id-Nr.: DE 812532055 St.-Nr.: 143/174/40341
Hypo-Vereinsbank München BLZ: 700 202 70 Kto.-Nr.: 39 990 040