

# R-401 Series Supercritical Fluid Extraction System & SCWO



## Features

- SFE & SCWO can be selected according to its using purpose.
- Supercritical Fluid Extractions and Reactions' Capacity, Pressure, Temperature, etc, are all optional selections available.
- As for Capacity, it is standard from 20ml up to 2-Liter, and when more than 2-Liter it should be an option.
- Designing is available from 20ml up to 500ml for 10,000psig, and for 5,000psig when 1 Liter and 2-Liter.
- SFE & SCWO will be LabVIEW Software using for design so as to be controlled.

## Physics and Chemical Feature of Supercritical Modulus

Pure water becomes supercritical state when its temperature and pressure come up more than to 374°C, 218atm of critical value. The water in the vicinity of critical point is compressible fluid and, in addition, the Density, Inductivity, Viscosity, Heat capacity, Internal-energy, Electricity conductivity, etc, are all totally different in its Physics and Chemical Feature. In the vicinity of critical point, Water act as a superior Solvent against the Nonpolar Compound. The high Internal-Energy of Supercritical modulus keeps farther distances between the Water-Molecule and consequently, the intensity of Hydrogen bond between Molecules in closer neighborhood becomes forcedly reduced. In the scope of Supercritical, the Water Degree of Dissociation can be shown by the Density and Mathematical Function of Temperature, and in this case, Density affects much more. By the same token, the Dissociation Constant of Salt and Acid in the Supercritical Modulus being very much affected by the Water Density.

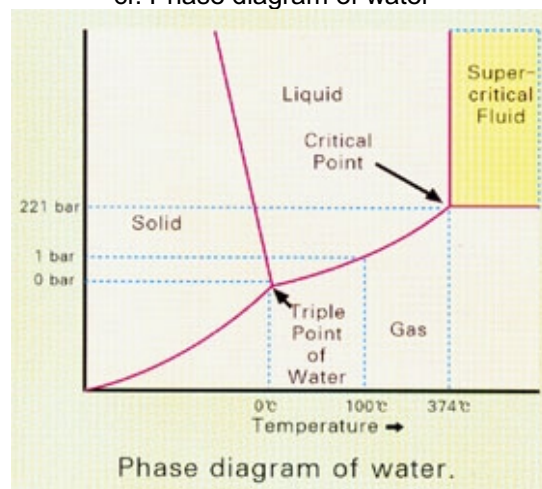
The increased density followed by the increased pressure under fixed temperature can accelerate the Dissociation of the Salt and strong Acid. Likewise, the Electrical Conductivity of Electrolyte in the Supercritical Modulus being tremendously affected by the Density of Water. Viscosity is, as well known, an important factor in order for us to understand the Transfer Phenomenon of molecule in the Supercritical Modulus, and the Supercritical Modulus Viscosity increases according to the increase of the Density.

## Oxidation Process of the Supercritical Modulus

The Supercritical Modulus Oxidation Process, which make use of characteristic feature of Solvent, has various advantages in the Waste Water Treatment, as it goes on in a rapid period of time under high temperature and pressure the Wet Process of Oxidation can, differently from other Subcritical Oxidation Process, decompose a big amount of waste water within a short period of time in high level of treatment even with a small capacity Reactor.

Supercritical Fluid Extraction Advantages for removing analytes from solid and semi-solid samples

cf. Phase diagram of water

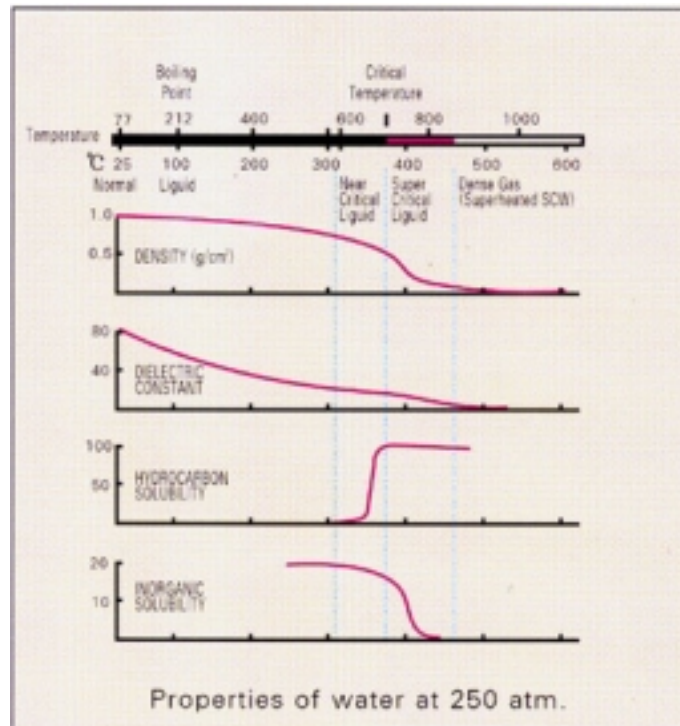


## Supercritical Fluid Extraction Advantages for removing analytes from solid and semi-solid samples

- Reduced sample preparation time
- Higher recovery rates
- Economy
- Safety from organic solvents

Carbon Dioxide(CO<sub>2</sub>) is the gas most commonly used as a supercritical fluid. CO<sub>2</sub> is :

- Safe
- Inexpensive
- Readily available
- An ideal substitute for many hazardous and toxic solvents  
cf. Properties of water at 250atm.



## SFE & SCWO Specifications

### Temperature to 500`C

- Precise control over wide range of temperatures
- Quick
  - Temperature to 500`C in only 80 minutes
  - Temperature rate of climb is 36`C/min
  - Thermally labile compounds are not degraded before extracted
  - High temperatures eliminate the need for modifiers
- Oven and vessel temperatures monitored separately

### Capacity Pressure

- Largest oven of any commercial, analytical system
  - Can hold two large 100ml vessels (10,000psig)
  - Can hold two 1 Liter vessels (6,000psig)
  - Can hold one 2-Liter vessel (5,000psig)
  - Allows for more accurate trace analysis
- Ability to move to pilot investigations

## Pump Module

- Easily pressurizes to 10,000psig (680bar)
- Control pressure with no complicated electronics
- Air driven liquid pump capable of running multiple ovens
- Adjust the Show rate from 0 to 32L/min of CO<sub>2</sub>
- Built-in safety features
  - Audible alarm
  - Warning light
  - Relief valve
  - In-line rupture disc
  - Air Compressor (150psig)

## Heater Module

- Largest available heater
  - Maximum size for trace analysis
  - Pilot operations
- Achieve 500`C in 80 minutes
  - Thermally labile compounds not degraded
  - Other heaters can take 20 minutes
- Thermocouple measures exact temperature
  - Other systems vary 20`C between heater and vessel
- Vertical mounting eliminates bypass problems

## Control and Collection Module

- Variable micro-metering valve
  - Eliminates expensive replacement of clogged fixed restrictors
  - Manual adjustment of flow rates
- Easy-to-change flow rates
  - No time consuming changing of fixed flow restrictors
  - No wrenches required to optimize the flow rates
- No contamination from sample carryover
- Collect analyte
  - SPE cartridges for further analysis
  - Standard solvent trapping

## Supercritical Fluid Extraction System & SCWO P&ID

### Ordering Information

401	A	B	C	D	E
	Capacity	Pressure	Temperture	Power	Control System
<b>Series</b>	1 : 20ml	1 : 3000 psig	1 : 100 `C	1 : 220/60/1	1 : PID/Tach/PG
<b>1 : SFE</b>	2 : 50ml	2 : 4000 psig	2 : 200 `C	2 : 220/60/3	2 : PID/Tach/PI
<b>2 : SCWO</b>	3 : 100ml	3 : 5000 psig	3 : 300 `C	3 : 110/60/1	3 : R & S/Tach/PLC
	4 : 300ml	4 : 6000 psig	4 : 400 `C	4 : Other	4 : PLC(LabVIEW)
	5 : 500ml	5 : 10000 psig	5 : 500 `C		
	6 : 1 L	6 : Other	6 : Other		
	7 : 2 L				
	8 : Other(Optional)				

*labkorea*