

**CONTACT DETAILS:**

Research Results Transfer Office-  
OTRI  
University of Alicante  
Tel.: +34 96 590 99 59  
Email: [areaempresas@ua.es](mailto:areaempresas@ua.es)  
<http://innoua.ua.es>

**ABSTRACT**

Spanish and Italian researchers have developed a device to irradiate solid or liquid samples with microwaves (MW) and/or ultrasounds (US). The device allows the user to irradiate samples simultaneously, consecutively or alternatively, with both kinds of energy, but always directly over the sample. The system may be used for improve and reduce time consuming in the sample preparation step in an analytical process. The device has been successfully used for the rapid and efficient determination of the COD (Chemical Oxygen Demand). The researchers are interested in transfer the design and manufacturing know-how of this device to companies involved in analysis equipment; and design and manufacture this device particularly for any company/institution interested.

**ADVANTAGES AND INNOVATIVE ASPECTS****MAIN ADVANTAGES**

This device ensures the following properties:

- Easy management.
- Security.
- Effectiveness.

The system offers a novel configuration which allows the device to be used in a very wide range of applications. In addition, the system allows to reduce the time and sample consumption, and is easily to automate and handling.

**INNOVATIVE ASPECTS**

Presently, alternative products to this technology are available in the market. It is possible to irradiate samples with microwaves and ultrasounds, simultaneously, but not directly over the sample. On previously devices, while the sample is being irradiated directly with microwaves, is radiated indirectly with ultrasounds, using a liquid medium to transfer ultrasound energy.

So the main novelty of this device is to irradiate simultaneously or alternatively a solid or liquid, but always directly over the sample. With this device, it's possible to improve the efficiency of the chemical processes (liquid-liquid, solid-liquid or gas-liquid extractions, sample digestions, synthesis,...).

**MARKET APPLICATIONS**

There are a large number of analytical applications where the sample preparation is the most critical step. It is a time consuming step and takes place the major errors in the process.

The COD (Chemical Oxygen Demand) determination is one of these

applications. The conventional method is tedious and has some problems. It's difficult to oxidize quantitatively some difficult compounds, like pyridine. With direct and simultaneous irradiation with microwaves and ultrasounds, it's possible to reduce the oxidation time and to improve the oxidation efficiency of difficult compounds (Table 2).

Table 2. Comparison of COD values and relative standard deviation (%) obtained with different methods.\*

\* Number of replicates: 5.

This system may be applied to COD determination or any extraction, digestion or chemical synthesis process. It could be useful in such areas as biotechnology, food, chemistry, wastewaters, pharmacy and cosmetics.

---

#### COLLABORATION SOUGHT

An agreement on the know-how licence and/or of the patent in order to transfer the rights regarding its use, manufacture or the commercialisation is sought.

Two types of cooperation are sought by the Department of Analytical Chemistry of the University of Alicante:

- Transfer the design and manufacturing know-how of this device to companies involved in analysis equipment that may be interested in its marketing.
  - Design and manufacture this device particularly for any company/institution interested.
-