COEI-1-MEMULT Ultrafiltration membranes

1. Object, origin and scope of application

Membranes belonging to the family of porous membranes, these can be organic or inorganic, and are generally anisotropic (asymmetric) or composite membranes; they may have a spiralled or "spiral-wound", flat sheet or "frame and plate", tubular or hollow fibre configuration.

Ultrafiltration is a physical separation process which is applied to the separation of particles ranging from 0.001 to 0.1 µm with retention of macromolecules and colloidal aggregates.

Ultrafiltration membranes are characterised by the retention of standard macromolecules with known molar masses. The cut-off threshold (or MWCO for molecular weight cut-off) is defined as the molar mass of a macromolecule from the standard range that would be retained at 90 or 95%.

The active layer of the ultrafiltration membranes consists of organic or inorganic material that has a microporous structure with pore diameters of about one nanometre.

2. Procedure principle

This is a physical filtration method allowing the particles and macromolecules in the must or wine to be retained using a semi-permeable membrane driven by a pressure gradient at ambient temperature.

The process is carried out as a tangential flow. The apparatus mainly consists of what is called a "booster" pump feeding a circulation pump between 2 and 10 bars, a membrane block and monitoring equipment, such as a flowmeter, pressure indicator and controller, etc.

3. Composition

All the equipment used in the procedure conforms with regulations relating to equipment in contact with food (pipes, pumps, monitoring equipment, joints, etc.).

These membranes are usually prepared through *in situ* polymerisation of a polymer on the surface of a porous substrate. The thin layer serves as the discriminating membrane, while the porous substrate acts as the physical support.

Examples of the main organic polymers used may include cellulose acetate, polyacrylonitrile, polyamide, polysulfone, polyimide, etc.

Mineral membranes are usually the composite materials, since the support is different from the active layer. They only exist as flat or tubular membranes. For the supports, ceramics make up the majority of membranes, but porous carbon and metal oxides may also be used. Active layers are often comprised of aluminium oxide, zirconium dioxide or titanium dioxide (in the case of ceramics).

4. Labelling

The main characteristics should be indicated on the label, particularly the batch number.

5. Manufacture

Through a number of procedures, it is possible to obtain a whole range of pore sizes (from MFT to the dense membrane of RO).

The final characteristics (thickness, porosity, pore size, internal structure) of the membrane depend on a great number of parameters (choice of ternary solvent/polymer/non-solvent, composition of collodion, addition of porogenes, operating conditions - temperature, casting speed, diameter/thickness of the collodion, etc.)

For mineral membranes, the active layer is generally obtained by the sol-gel method, then laid on the solid support. The final step is sintering (between 400 and 1200 °C) which is used to adjust the average diameter of the pores of the membrane from the grain size of the initial powder.

6. Membrane cleaning

The user may use inorganic products authorised according to regulations, provided that the operation ends by rinsing with water so as to completely remove the cleaning product before adding the must or wine.

7. Limits

- All the equipment in contact with food products must comply with the standards in force.
- There should be no noticeable change in the organoleptic characteristics of the must.

Any potential release of the product or derivative comprising the membrane must comply with the current specific migration standards for the various constituents of the equipment.

8. Special restrictions

The membrane must meet the regulatory requirements for equipment in contact with food.