CLAIMS

1. A reactor including a vessel (1) for containing:
    - a mass to be treated, and
    - at least one lighting device (2a, 2b) intended to promote the treatment of this mass,

   wherein each lighting device (2a, 2b) comprises:

- a light diffuser (21), the diffuser (21) including at least one micro-etched plate (211) which is transparent to light radiation (23), said plate (211) having opposite rear and front faces (2113, 2114) and at least two edges (2111) between the rear and front faces (2113, 2114), the area of each face being greater than the area of each edge, the rear face (2113) including a plurality of micro-patterns (2112),
- a light source (22) to generate the light radiation (23), the light source (22) being disposed on at least one edge of the plate (211) and being oriented so that the light radiation (23) it generates propagates in the plate (211),
- wherein each light diffuser (21) further comprises at least one transmission layer (213), each layer of transmission material (213) extending over the front face (2114) of a respective plate (211), and
- wherein a pitch between two adjacent micro-patterns (2112) is comprised between 100 and 900 µm, and is greater than or equal to 100 µm.

2. The reactor according to claim 1, **wherein** each plate (211) is substantially flat and comprises four edges (2111), each light source (22) including a plurality of light-emitting diodes disposed on at least one of the smallest edges.

3. The reactor according to claim 1, **wherein** each plate (211) is cylindrical and comprises two edges, each light source (22) including a plurality of light-emitting diodes disposed on at least one of the two edges.

4. The reactor according to one of claims 2 or 3, **wherein** the diodes of the plurality of light-emitting diodes are disposed on the edge of the plate (211) furthest from the bottom of the vessel (1).

5. The reactor according to any one of claims 1 to 4, **wherein** each light diffuser (21) comprises a pair of micro-etched plates (211) arranged so that their rear faces (2113) extend opposite one another.

6. The reactor according to any one of claims 1 to 5, **wherein** each light diffuser (21) further comprises at least one layer of material (212) reflecting the light radiation (23), each layer of reflective material (212) extending over the rear face (2113) of a respective plate (211).

7. The reactor according to any one of claims 1 to 6, **which** comprises a plurality of light diffusers (21), two adjacent light diffusers (21) being spaced apart by a distance comprised between 2 and 10 centimeters, preferably between 4 and 8 centimeters, and even more preferably substantially equal to 6 centimeters.

8. The reactor according to claim 7, **wherein** the light source (22) of each lighting device (2a, 2b) is adapted to generate a continuous light radiation.

9. The reactor according to any one of claims 1 to 6, **which** comprises a plurality of light diffusers (21), two adjacent light diffusers (21) being spaced apart by a distance comprised between 8 and 150 centimeters, preferably between 10 and 50 centimeters, and even more preferably substantially equal to 11 centimeters.

10. The reactor according to claim 9, **wherein** the light source (22) of each lighting device (2a, 2b) is adapted to generate discontinuous light radiation in the form of flashes composed of alternating dark phases and illuminated phases, for example at a frequency comprised between 10 and 50 kHz.

11. The reactor according to any one of claims 1 to 10, **wherein** the vessel has a capacity of 100 m^3, the surface covered by the plates of the light diffusers (21) being comprised between 2000 and 3000m^2, preferably between 2250 and 2750m^2, preferably substantially equal to 2500 m^2.

12. The reactor according to any one of claims 1 to 11, **wherein** the lighting devices are composed of:
    - a first group (2a) of lighting devices with a first height (h_a), and

- a second group (2b) of lighting devices with a second height (h_b) lower than the first height (h_a),

a lighting device of the second group (2b) being disposed between two successive lighting devices of the first group (2a).

13. The reactor according to any one of claims 1 to 12, **which** further comprises an injection system including a plurality of diffusion units (3), each diffusion unit (3):
    - extending between two adjacent light diffusers (21), and
    - being separated from the other diffusion units (3) by at least two successive light diffusers (21).

14. The reactor according to any one of the preceding claims, **wherein** each lighting device (2a, 2b) is independently connected to an electrical power supply module so that each lighting device (2a, 2b) can be removed individually from the reactor during its operation.