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Purification process of polar liquid wastes containing colloidal dispersions of solvated particles

The utilized molecule is natural, food grade and not soluble: consequently it doesn't contribute increasing the salts and/or impurities content in the effluent.

The present invention concerns a process to purify polar liquid wastes (f.i. water) containing colloidal dispersions of solvated particles. The liquid resulting from this process is totally purified from said solvated particles and can thus be reintroduced in the environment or recycled into the primary cycle of the industrial process, from which the liquid wastes had come, without undergoing further treatments.

It is known that the main problem connected to the use of water for agricultural, civil and industrial purposes, lies in the huge consumption of water which, after having been used, cannot be re-employed due to the impurities contained therein, because otherwise it would create several pollution problems when disposed of in the environment.

The present international and European Union guidelines on water consumption provide for drastic reductions in the water resources for agricultural, civil and industrial uses, imposing the partial or total recycling of the wastewaters resulting from the primary working cycles in which the water is used.

Liquid colloidal dispersions are characterized by dispersions of solids, liquids or gases into a homogeneous liquid. Two stability factors enable the particles of the different substances to remain in suspension and separate so as to form a liquid colloidal dispersion: electric charge or solvation.

Electric charge causes the repulsion of the particles and is determined by the absorption of ions onto their surface.

Solvation is determined by the tendency of many substances to cause the molecules of the polar liquid in which they are suspended to strongly adhere thereon, forming a coating which prevents them from joining and thickening.

The treatment of liquid colloidal dispersions characterized by electrically charged particles involves no particular difficulties, in that the addition of electrolytes reduces the dispersion, causing the flocculation of the dispersed impurities.



The problem created by solvated particles is instead more difficult to solve, since solvation confers to the colloids a far higher stability than electric charge. Solvated particles are practically insensitive to the action of electrolytes and furthermore, polar liquids allow stable suspensions to be formed also with relatively large particles (emulsions and/or suspensions of bentonites, clays, kaolin and the like).

Hence there is an unsatisfied demand for a simple and economic process, apt to efficiently separate solvated impurities from polar liquid wastes containing colloidal dispersions thereof, so as to allow the resulting clear liquid to be recycled or discharged into its natural environment with no pollution problems. Since many primary working processes make use of large quantities of fresh water, a process of this type would provide the considerable advantage of drastically reducing fresh water consumption; in fact, once the dispersed impurities have been removed, it would often be possible to recycle the water initially used in the primary process.

Such a process will obviously be the more advantageous, the higher the possibilities of its universal use, independently from the nature of the solvated impurities.

Italtraco has thus been involved in deep studies in order to seek a purification process allowing to obtain clear liquids from polar liquid wastes containing colloidal dispersions of solvated particles, to be carried out on the widest range of liquid wastes containing this type of colloidal dispersions, and to provide the highest reliability with the most disparate solvated substances. A further problem having to be faced in said process is to use therein only additives which are not apt to increase the salt and/or impurity content in the wastewaters being purified; moreover, such additives should preferably be food grade one; since wastewaters result from food industries to recycle the purified wastewaters in the primary working cycle, the additives used in the purification process must be harmless.

At the end of his studies Italtraco has discovered a natural molecule, food grade, that has the capacity to give rise, itself, to the forming of flocks with solvated particles. The agglomeration and flotation or sedimentation take place in a very short period of time -in the range between few seconds and a minute- and the separation of the clear liquid is easily obtained.

The process of the present invention is also characterized by the fact that the treated liquid is by no means altered chemically, in that the used molecule is totally insoluble and is thus fully eliminated; this characteristics allows to re-employ the clear liquids, obtained with the process of the invention, in the primary cycle from which the liquid wastes have flown out.

The present invention can be efficiently applied to all the polar liquid wastes containing solvated particles, independently from the chemical nature of the particles, since that the purification process involved is essentially of the physical type.

Besides being widely employed in the treatment of industrial and agro-industrial effluents, this treatment is also utilized, with very good results, for the removal of all liquids and solids dispersed in the produced waters from oil wells before the oil-in-water separation.

This treatment has also proven particularly useful for those effluents that must undergo nanofiltration, reverse osmosis, or electrodialysis processes, because it permits to eliminate microfiltration/ultrafiltration treatments, to increase the performances and to prolong the life of the relevant membranes.