

STUDY REGARDING THE USE OF MICROWAVES TECHNOLOGIES FOR THE ENVIRONMENT PROTECTION

STUDIU PRIVIND FOLOSIREA TEHNOLOGIILOR CU MICROUNDE PENTRU PROTECȚIA MEDIULUI

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Applications of the microwaves technologies are developing fast, but only in few cases these applications are used at the industrial level for the pollutants elimination. This work presents few problems of the environment that can be efficiently solved through electrotechnologies based on microwaves: wastages treatment technologies, coal filters regeneration, concrete walls treatment and of the contaminated soils, vermin elimination from the wood structures, the elimination of toxic acids of nitrogen and sulfur from the burning gases and indirectly, the preparation of polyelectrolytes for the used waters treatment.

Key words: microwaves technologies, environment protection

Introduction

The processing of raw material and the obtainance of material goods contribute to our present living standard, but also to the producing of great quantities of polluting wastages with harmful effects on long term about the environment. The air and waters pollution, the acid rains, the reduction of the ozone layer, the greenhouse effect, are great problems with which we confront today. This environment problem causes growing reaction of the people against the companies, which don't take them into account in their current business.

That is why in the advanced countries the governmental legislations impose severe limits about the polluting transmissions in the air and water. This situation generated the development of the unpolluting technologies that process the raw materials and of treatment methods for different polluting wastages. Surprisingly, this new preoccupation, led to the growth of the industrial processes efficiency, to the costs decrease and finally to the profits growth, because many types of materials have been recovered and a great quantity of energy has been saved.

Material and Methods

The electro technology constitute now a very efficient way for the water, soils and gases pollutants treatment, contributing in this way to the growth of the living standards through the surrounding environment conservation. The electro technology based on the use of microwaves energy is taken into account especially for the pollutants elimination owed to the unique properties of the high frequency electromagnetic fields to transfer the energy directly to the substance molecules or atoms with which interact to realize this transfer selectively and in the material weight and to be easy controllable.

The microwaves treatment known especially under the name of ‘dielectric heating’ is relatively great in the environment problems solutions.

Results and Discussions

a) WASTAGES TREATMENT

In the last 15 years have been developed numerous procedures of wastages treatment with the help of microwaves. Through technologies based on the electromagnetic field from the audio-frequencies and microwaves include was realized the treatment of numerous types of wastages: nuclear, medical, used tires, elastomers etc. Most of these technologies are at the laboratory scale but some of them are already at the industrial scale.

Wastages treatment technologies with the help of RF or of microwaves include two kinds of processes: oxidant thermal destruction (cremation) and unoxidant thermal destruction (pyroliza). In both processes molecules are broken because of the physical-chemical action determined by the radiation field. In this way, at temperatures of 1600-3000°C the wastages are damaged at simple environmental friendly molecules.

In Table 1 there are presented the most interesting technologies from this field mentioning the advantages and limitations of each of them.

b) THE ACTIVE COAL FILTER REGENERATION

Under the influence of the surrounding environment quality legislation, the use of the active coal filter extends fast. The usage of the active coal for the filter is based on its property to adsorb in its micro-pores different impurities contained in the gases or water fluxes that they come into contact with. According with the type and the quantity of the impurities restrained in the filter it is used its regeneration. The regeneration is attractive only when the regenerated products have an economically value, for example the solvents are recuperated.

Unconventional technologies of wastages treatment

Table 1

TECHNOLGIE	OPERATIONS	TREATED WASTAGES	BENEFITS	LIMITATIONS
Heating and irradiation with microwaves and RF for thermal and molecular degradation	Pyroliza Hydrocracking Decontamination Drying Temp.100-1500°C	Liquid, solid or gases wastages; radioactive wastages; medical wastages	Easy transportable equipment, easy start and stop, low operation costs	The supplementary treatment of the evacuated gases is necessary
The microwaves cremation and irradiation	The wet wastages cremation; the oxygen usage for the temperature growth from 800 to 1600°C	Solid or liquid wastages	Great temperatures allow the waste treatment without toxic gases elimination	The oxygen determines the growth of price; it is preferable the usage of solid wastages
Electromelting and piroconversion	Pyrolysis in melting; electric furnace; temperature 1260°C	There can be treated also dry solid wastages; rubber, plastic, absorbant coal, radioactive wastages	Results glassy material with smaller volume than the initial one and with good storage properties. Small sizes equipment.	Doesn't treat the contaminated soils; the supplementary treatment of the evacuated gases is necessary; great power costs.
Fluid oxidizing in superficial state.	There are used great temperatures (650°C) and great pressures (350 atm) for the organical substances oxidation from watery solutions.	Liquid or semisolid watery wastages that contains hard degradable organical compounds.	Fast complete oxidation without toxic elimination.	Very high pressures determine the use of some complicated and expensive equipments. There cannot be used a continuous process.

The active coal filters regeneration is made classic by passing through the respective filter a flux of water or inert gas steam at high temperature. This regenerator flux cross after that a condenser in which are restrained the impurities, but the utilized heat for the inert gas warming is lost before its passing through the active coal filter. Through direct treatment of filter with a microwaves flux accurately applied and controlled, are obtained many advantages: the regenerator gas quantity is reduced, it is produced a direct heating of the inert gas in the filter and it is reduced the quantity of the lost warm in the condenser. The regeneration treatment is cheaper because the used gas volume is smaller and the regeneration time is shortening few times (the microwaves heating is fast and direct).

Though, the market for this application is still very small because only 7% from the active coal filters are regenerating.

Conclusions

1. The microwaves technology of biomedical wastages treatment is very important for its efficiency and its low cost.
2. The microwaves technology of wastages treatment has envirimty frendly effect about the environment, because eliminates the chemical factors utilization and classical burning that produces toxic gases.
3. The usage of microwaves technology reduces the treated wastages volume with about 85% and increases the possibility to introduce them easy and without any danger in their surrounding environment.
4. Through microwaves technology usage are obtained better and more efficient pest control results than through heating with warm air.
5. These technologies use equipments easy to transport and manipulate, and the operating costs are low.

Bibliography

1. **Breccia, A.** (1997) - Waste treatment by RF and microwave power'', in Proceeding of the Conference: Microwave and High frequency heating, Fermo, Italy.
2. **Hedlesson R.A. and Doores S.** (2000) – J.Food Protection, 57(11)1025 nov.2000
3. **Kirk R.E. and Othmer D.F.** (2000) - Microwave technology" vol 16 of Encyclopedia of Chemical Technology-Interscience, New York 2000
4. **Banu C.s.a.** (2001)- Proteine alimentare, Editura Macarie, Targoviste.
5. **Banu C., Vizireanu C.** (1998) -Procesarea industrială a laptelui, Ed. Tehnica Bucuresti.
6. **Ciobanu D. Ciobanu, R.** (2001)- Chimia produselor alimentare, Editura Tehnica-Info, Chisinau.