BEHAVIOUR OF SEPiolITE, VERMICULITE AND BENTONITE AS SUPPORTS IN ANAEROBIC DIGESTERS

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One of the most important problems in anaerobic processes is the loss of biomass. In order to solve this problem, reactors containing supports have been designed with the aim of fixing the biomass and obtaining high loading densities and minimum hydraulic retention (Henze and Harremoes, 1983).

Glass beads, volcanic rocks (Salkinoja-Salonen et al., 1983), needle punched polyester (Harvey et al., 1984), feldspar particles (Lequerica and Toldrá, 1986) etc. are the more frequently used supports in anaerobic digesters.

The aim of this paper is to study the effect of some clay minerals in anaerobic digestion. The clay minerals used were: natural sepiolite, purified sepiolite, both from Vallecas (Spain), vermiculite from Santa Olalla (Spain) and bentonite from Gador (Spain). Expanded polyuretane and PVC have also been used in order to know possible differences between these materials, frequently used as supports in the anaerobic digesters, and clay minerals.

The reactors used had a capacity of 1 liter and were filled up with specific cultures for the development of either methanobacteria or methane and sulphate-reducing bacteria. Blank support free reactors have also been used.

Before and after the process of digestion of the samples were studied by DTA, TGA, electron microscopy, X-ray diffraction, IR and atomic absorption.

The study of samples from the reactors containing cultu-
res for methanobacteria shows that purified sepiolite was the best material for the development of these bacteria. This is the only mineral able to fix the bacteria when it is in suspension, and produces easier decantation than other materials. This mineral is followed by expanded polyurethane and bentonite in their production of methanobacteria.

In the reactors with specific culture for methane and sulphate-reducing bacteria, the purified sepiolite inhibits the development of sulphate-reducing bacteria and increases methanobacteria production.

Expanded polyurethane produces more sulphate-reducing bacteria and fewer methanobacteria than other materials tested.

In both cultures, when vermiculite is the material used, there is a cation exchange of $K^+$ for the $Mg^{++}$ ions of the mineral, related with a higher gas production; for this reason we suggest that magnesium might play an important role in the process. The chemical composition of sepiolite and some facility to give up $Mg^{++}$ to solution may also influence the large methane production by this mineral.

CONCLUSIONS

1) The purified sepiolite in suspension is the material that produces more methanobacteria, inhibiting the sulphate-reducing bacteria production. The best results for decantation are also obtained with this material.

2) The magnesium liberated from the support may play an important role in anaerobic digestion.

3) Polyurethane produces methanobacteria, but also many sulphate-reducing bacteria, giving $H_2S$ and thus produces a lower quality gas.
REFERENCES


