

DESCRIPTION

Calixarenes are new and advanced macrocyclic materials that present interest due to their special structures and multiple functionalization possibilities, but mostly due to their properties of recognize ionic and molecular species.

We obtained p-tert-butylcalix[8]arene by alkaline condensation (aqueous solution of sodium hydroxide) of p-tert-butylphenol (PTBP) with paraformaldehyde, using xylene as solvent. The condensation was carried out in inert atmosphere (argon) and with continuous removal of resulting water.

OBJECTIVES

General objectives:

Alignment to domains promoted by FP7 in nanoscience and environment protection, with removal/reduction of pollutants from economic agents;

Alignment to priority scientific and technological domains in European Union, as textile industry.

Specific objectives:

Contribution to the development of knowledge in the domain of nanomaterials.

The researches refer to the decontamination of wastewaters from textile industry and were developed on the following directions:

- Synthesis of p-tert-butylcalix[8]arene
- Experiments for treatment of waters contaminated with dyes, using p-tert-butylcalix[8]arene

OPERATIONS

The process for obtaining calixarene consists in two stages and we established the optimal parameters:

a) condensation

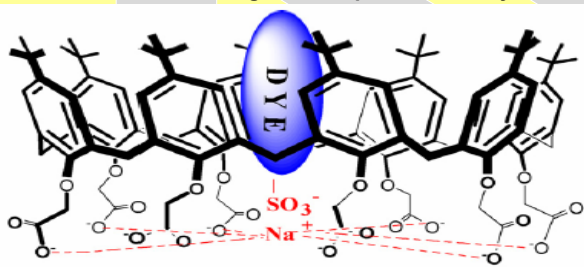
- inert atmosphere (Ar or N₂)
- the amount of solvent: 12 times the amount of PTBP
- optimal temperature: 120-135 °C
- molar ratio PTBP : CH₂O : NaOH between 1:1.0 – 2.2 : 0.03 – 0.05
- the aq. sol. of NaOH of concentration between 4-10 N
- time: 3.5-4 hours
- the concomitant removal of resulting water.

b) processing

- cooling and filtration
- consecutive washing with equal portions of toluene, acetone, water;
- drying at 100-120 °C in oven, under vacuum
- purification from chloroform
- drying

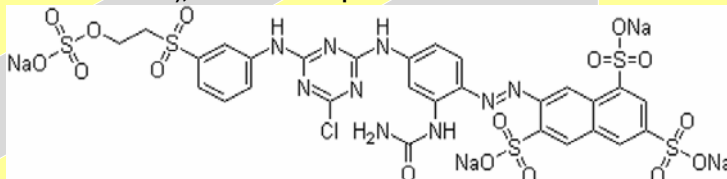
PRINCIPLE OF WORK

The principle of our work is based on the capacity of calixarene to form host-guest compounds with dyes.



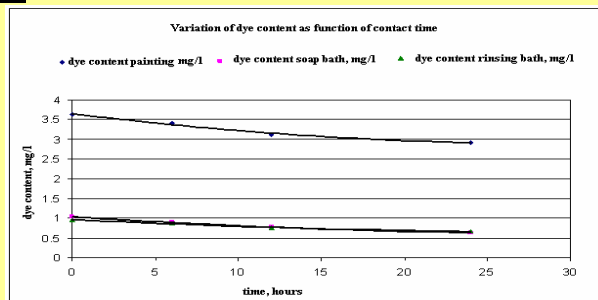
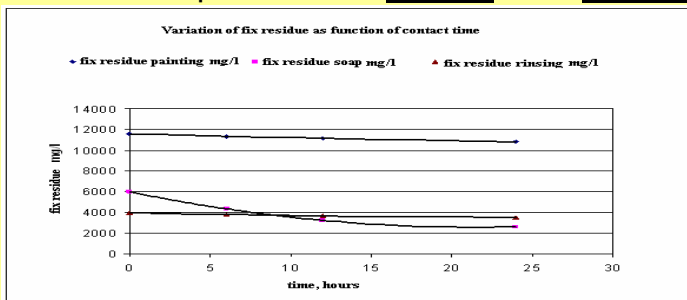
CONTAMINANT

In the lab experiments for treatment of waters contaminated with dyes, we used wastewaters from painting processes. We realized the experiments using all three types of wastewaters from painting process (painting, rinsing and soap baths) that used BEZAKTIV GELB S-BR (Colour Index: CR Yellow 145: CAS-93050-80-7), with structure presented below.



RESULTS

After the experiments of decontamination we characterized the waters from physical-chemical point of view. Almost all physical-chemical characteristics of the wastewaters dropped with increasing of contact time with calixarene compound. The most representative characteristics that are a measure of performance for using of p-tertbutylcalix[8]arene in the decontamination processes are the fix residue and the concentration of dye.



CONCLUSIONS

Due to their easy synthesis route, as well as the relative simple modification possibilities, the calixarenes exhibited a growing interest in the latest years in host-guest chemistry. These compounds presented interest due to their special structures and multiple functionalization possibilities, but mostly due to their properties of recognize ionic and molecular species.

The decontamination technology lead to good results. Both fix residue and dye content dropped after treatment with calixarene compound.

The yields of removing fix residue reached over 50%. The yields of removing dyes reached 40%.