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BIODEGRADATION OF PROPYLENE CARBONATE

An in-depth study of the biodegradation of propylene carbonate is lacking. An often used indicator of the ability of microorganisms of rivers, lakes, or sewage disposal systems to utilize the test substance with oxygen in a biochemical reaction is the BOD5 or five-day biological oxygen demand test. Longer periods of contact such as ten days (or longer) can also be used. The interpretation of BOD5 data is not necessarily straightforward. However, the observed uptake of oxygen can be taken as some measure of the tendency of the test substance to "biodegrade". The ultimate products of biodegradation are usually assumed to be carbon dioxide and water in the case of chemicals containing only carbon, hydrogen, and oxygen as with propylene carbonate. However, the BOD5 test does not yield any direct information on the products metabolism.

Propylene Carbonate was subjected to the standard 5-day BOD test and after five days was found to have consumed approximately 63% of the theoretical amount of oxygen. After ten days, this figure was increased only marginally to approximately 64%. This amount of oxygen consumption is comparable to many other synthetic organic chemicals such as methanol, ethanol, and acetone, and it can be interpreted that Propylene Carbonate is fairly readily biodegraded.

Another factor related to the environmental fate of Propylene Carbonate is that this compound is slowly hydrolyzed in an aqueous medium to propylene glycol and carbon dioxide. Propylene glycol is a relatively non-toxic substance and itself undergoes biodegradation in the presence of microorganisms at a rate similar to Propylene Carbonate.

As stated above, although the data are few, there is reason to believe that propylene carbonate should biodegrade relatively quickly and that no toxic degradation products should be formed.

119: 124587S TEST ON BIODEGRADABILITY AND BACTERIAL TOXICITY OF THE CHLORINATED HYDROCARBON SUBSTITUTES PROPYLENE CARBONATE (I) AND ME-PYRROLIDONE (II). KAYSER, GERNOT; KOCH, MICHAEL; ERLMANN, WOLFGANG; RICK, W. (INST. SIEDLUNGWASSERBAU, UNIV, STUTTGART, W-7000 STUTTGART, 80 GERMANY). GIT FACHZ. LAB. 1993, 37(5), 414,416-419 (GER). A MANOSTATIC RESPIROMETER TEST PROCEDURE WAS USED FOR THE DETERMINATION OF BIODEGRADABILITY AND TOXICITY OF THE CHLORINATED HYDROCARBON SUBSTITUTES PROPYLENE CARBONATE (I) AND ME-PYRROLIDONE (II) OF DIFFERENT DILUTIONS IN WATER (2509-2500 MG/L 10-1000 MG/L, RESPECTIVELY). DEGREES OF DEGRADATION OF 80% AND 87% FOR I AND II, RESPECTIVELY, WERE OBTAINED AFTER 10 DAYS. RESULTS OF EXPERIMENTS WITH DIFFERENTLY DILUTED SOLUTIONS REVEALED A GOOD BIODEGRADABILITY OF BOTH SUBSTANCES AND A RAPID DEGRADATION UNDER THE CONDITIONS OF AN AEROBIC WASTE WATER TREATMENT PLANT.