

Low cost disposal of EPS & XPS with Acetone

Dr. Parag Dalal

Asst. Prof. School of Studies in Environment Management, Vikram University Ujjain

ABSTRACT

Since 1935 as Carl Munters & John Gudbrand discovered “Polystyrene” we started using its foam as insulator in our life. Most easy Language of EPS polystyrene is Thermocol & XPS Polystyrene is Styrofoam. These two are large pollution products and generates about 4% of total solid pollution produced throughout India which accounts to about 6 Tons/day. If we try to find difference in EPS & XPS if we talk in English than there is no difference but in science there are many differences elaborated in this paper afterwards. Di-Methyl-Ketone also known as Acetone is an organic compound $(CH_3)_2CO$ and is the smallest Ketone known so far. There is no chemical reaction between EPS and Acetone it is just physical similar to sugar dissolving in water but here solubility limit is very high.

Key Words – EPS – Expanded Polystyrene, XPS – Extruded Polystyrene, Acetone, melt, Ketone, Organic, solid pollution, chemical reaction, sugar, water.

INTRODUCTION

First we talk about Acetone after all it's the show stopper. Acetone is also known as Propane one aka Di-Methyl-Ketone $(CH_3)_2CO$, it's also known as the smallest Ketone. As alcohol it's also having a pungent odor and is highly inflammable. The production of Acetone is about 7.2 Million Tons per year in 2020-2021. It's the most common building block in the organic chemistry industries. Any intake of acetone in humans can be disposed off through normal metabolic process is amount is less in quantity. It's naturally produced in human body and is present in blood and urine.

Acetone is produced from Propylene and about 85% is produced via CUMENE (Isopropyl Benzene) process, in this process the waste material produced is Phenol. In the CUMENE process one of the cheaper compounds Benzene is alkylated with cheaper compound propylene to produce complex CUMENE which is then oxidized by another Air process to produce two Rich Valuable products Acetone with Phenol.

Another oxidation process (Wacker-Hoechst process) involves the direct oxidation of propylene which results in hydration of propylene to give us 2-Propanol which is then de-hydrogenated to give Acetone. In past century acetone was produced by dry distillation of acetates e.g. $Mg \{(CH_3)COO\}_2$ or $Ca\{(CH_3)COO\}_2$.

Now let's talk about the base which is getting extinguished in our experiment – Polystyrene. In 1935 as Carl Munters & John Gudbrand of Sweden discovered polystyrene foam as an insulator product. This is commonly known as Thermocol. Thermocol is a non-biodegradable substance and is one of the major pollution sources across the world.

Burning of The rmocol is even more dangerous as it release harmful toxic gases and a large amount of Carbon Mono Oxide with vapors like Styrene, similarly XPS which is famous as Styrofoam is also a great danger even to landfills. These take hundreds of years to get decompose and also degrade the soil fertility. Yearly Thermocol waste is about 4% of total Solid Waste which account to about 6 Tons/Day.

The Polystyrene is used in two different forms by humans as –

- i. **EPS** –Expanded Polystyrene
- ii. **XPS** – Extruded Polystyrene

Both of them are been derived from Petroleum. The term “Thermocol” is so popular that both, EPS – Expanded Polystyrene, XPS – Extruded Polystyrene are called Thermocol, similarly as photocopies either black or white or colored are called Xerox.

The key difference between Thermocol and Styrofoam is that Thermocol is form of synthetic aerometric hydrocarbon foam were as Styrofoam is more commercial brand of polystyrene. In appearance polystyrene is transparent as well as Styrofoam is light blue in color. Thermocol is used in packaging, disposables and insulators were as Styrofoam is used in building material insulation, pipe insulation and mainly used in materials under roads and other structures to prevent soil disturbances due to freezing.



Fig 01: Thermocol Pollution (<https://www.rewariyasat.com/gk/how-thermocol-is-made-how-thermocol-is-made-ever-wondered-why-thermocol-is-so-light-89692>)



Fig 02: Styrofoam (<https://environmentaldefence.ca/2018/10/19/banthe foam/>)

Procedure – A sheet of Thermocol of vital statistics 5m x 5m x 20mm thick weights about 350 grams these 350 grams can be easily dissolved in 10ml of Acetone.

There is no chemical reaction as such in this process the Thermocol dissolved in acetone is exactly like sugar dissolved in water. A very small amount of slime is left over which is so small that we can consider that Thermocol is made of 98% air. The cost of acetone in local market is Rs.550/Liter this one liter of acetone can dissolve 1, 30,000 CC of Thermocol. The slurry left after melting of Thermocol, the acetone is evaporative so it gets evaporated quickly now if water is added and slurry is washed it can be used to make soap dish, non-chewable toys, cups and other decorative items. Concluding us to say that it's a Zero Pollution discharge system what we have done.

Experiment Photos –



Fig. 03: Styrofoam in Acetone



Fig. 04: Thermocol in Acetone



Fig 05: Slurry Left over



REFERENCES

- [1]. Dalal Parag. 2010 “Phythere-medation” Asian Journal of Environmental Sciences Vol 5(2) Pg 199-207 ISSN-0973-4759
- [2]. Dalal Parag. Low cost Energy Efficient water saving irrigation techniques Journal of Global Biosciences. 2020; 9(7): 7695–7708.
- [3]. Dalal Parag: (2011). “Liquid Biomedical waste management strategy”. Environmental Conservation Journal Vol 12(1&2). Pg. 87-93
- [4]. <https://www.rewariyasat.com/gk/how-thermocool-is-made-how-thermocool-is-made-ever-wondered-why-thermocool-is-so-light-89692>
- [5]. <https://environmentaldefence.ca/2018/10/19/banthe foam/>
- [6]. [https://www.sciencedirect.com/topics/chemistry/hoechst-wacker-oxidation#:~:text=The%20Wacker%20process%20or%20the,end\)%20to%20yield%20a%20ketone.](https://www.sciencedirect.com/topics/chemistry/hoechst-wacker-oxidation#:~:text=The%20Wacker%20process%20or%20the,end)%20to%20yield%20a%20ketone.)