

What is a biodegradable bag?

Biodegradation is the breakdown of an organic compound by micro organisms into CO₂ , water and mineral salts of any other elements present (mineralization) plus new biomass in Either/And of all of the conditions below :

- a) controlled environment by method of composting
- b) and/or aerobic conditions
- c) and/or anaerobic conditions
- d) and/or UV light

i.e. presence of any of the four conditions or all of the four conditions or a combination of any of the conditions i.e. under any climatic condition

A product claimed to be biodegradable should have >50% of the total organic carbon being converted to CO₂ & water by the end of the test period (i.e. 180 days)

For products consisting of a single polymer, 60% of the total organic carbon must be converted to carbon dioxide by the end of the test period (usually 180 days); For products consisting of more than one polymers, 70% of the total organic carbon must be converted to carbon dioxide by the end of the test period.

What is a degradable or totally degradable plastic bag (sometimes also known as oxo-biodegradable bags)?

Degradable or totally degradable plastic bag (sometimes also known as oxo-biodegradable bags) is a plastic bag with certain percentage (usually 1% to 3%) of degradable additives added to it such that when this plastic bag is sufficiently exposed to sunlight (UV), heat or stress etc, it will trigger breaking down of the larger plastic films/sheet to become smaller fragments. This process is also known as fragmentation or disintegration. Some Degradable additive suppliers called it Degradable.

Will PE + degradable additives make the bags finally biodegrade to become carbon dioxide and water?

Yes, but not in specific period without Sun Light or Moisture.

But there is a Biodegradable Additive Masterbatch which Biodegrades under any climatic Condition.

The biodegradation cannot reach the required time period if Photo Degradable Plastic is **Buried** under other garbage and therefore, according to the definition of biodegradability, Photo degradable product cannot be claimed a biodegradable product.

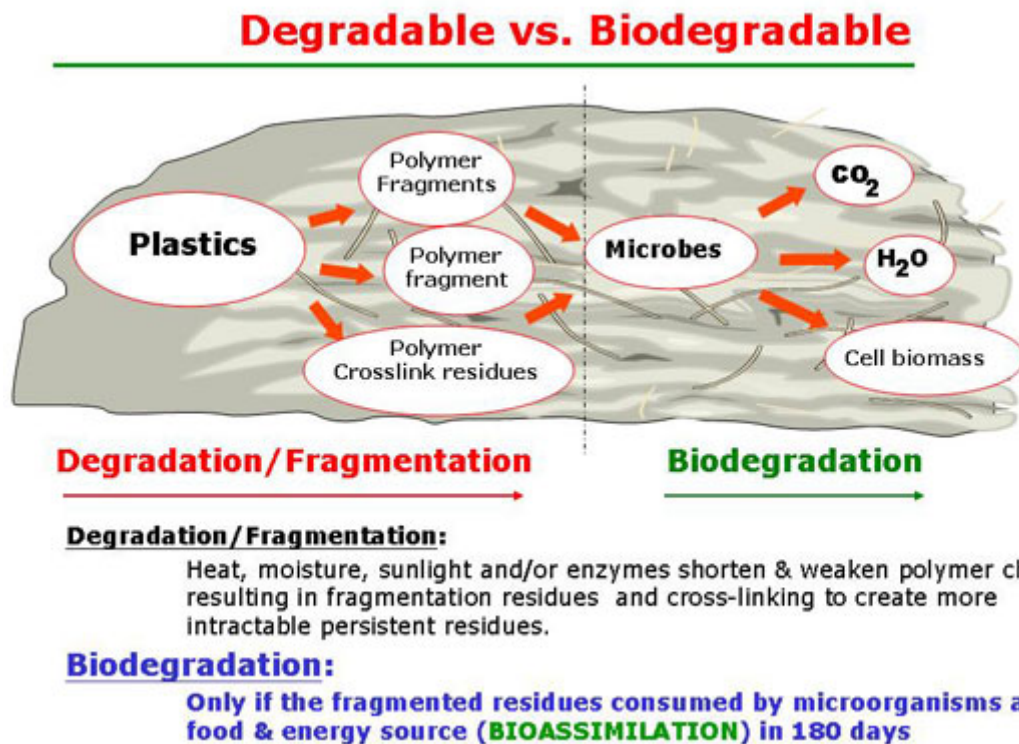
In fact, without a time frame, all materials are biodegradable materials. Even for a conventional plastic bag (like PP/PE), it will be totally biodegraded into carbon monoxide/dioxide and water in about 400 to 1,000 years.

Why do people want to make a conventional PE/PP bag degrade?

Many people think pollution caused by plastic products like plastic bags is because plastics do not degrade. They believe if they can make plastic degrades, then there will be no more pollution because these bags will be out of sight. Therefore, different metallic ions are added to make the excellent performing plastics to loss its outstanding physical performance: strength and elongation.

What is the difference between a biodegradable and totally degradable bag (sometimes also known as oxo-biodegradable bags)?

There are basically three different ways to turn a very long polymer (no matter it is plastic or others) into numerous smaller fragments (also known as oligomers or polymer fragments), being hydrolytic, oxidative and enzymatic means. When such long polymers were turned into much smaller oligomers or polymer fragments by any one of the three means above, we call this process **Degradation** and the substance being degraded a degradable substance. **However, only if all above fragmented residues consumed by microbes as a food and energy source in defined time and environment, then the process can be called Biodegradation** and the substance being biodegraded a biodegradable substance.



What is Oxo-biodegradable, what is the different between Oxo-biodegradable and biodegradable?

OXO-biodegradable means oxidation of conventional plastics when exposed to sufficient Sunlight (UV) or moisture. After such triggering of fragmentation, biodegradation may take place but in a much slower speed and cannot be completed in defined timeframe for biodegradation i.e. 180 days in a controlled composting environment.

Biodegradation has no such prerequisite. No oxidation is required. The only requirement is the presence of microbes. Biodegradation can be completed in 180 days under any climatic condition

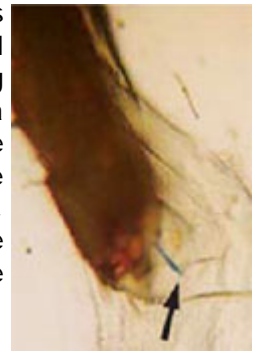
Someone said degradable bag although not completely/fully biodegradable, at least something eco friendly, a step towards environmentally friendly, is it true?

Definitely NOT TRUE.

1. One of the greatest Eco Friendly activities is recycling. With additives added to plastics, these types of plastic bags will immediately have very low recycling value because the objective of adding these additives is to make

- these bags decompose more easily and more quickly. Decompose more easily and more quickly means greatly loss/reduce strength/physical properties of bags which are the greatest value of recycled plastics. With the presence of these destructive additives in plastic bags, it makes plastic recycling activities almost valueless or impossible. If these type of activities do not stop, the supply of 100% recycled garbage bags will quickly and greatly affected. Why don't we try our best to recycle these valuable & recyclable plastics but make it degrade into valueless fragments?
2. PE + additives (or starch + PE) plastic bags, no matter how they are being called (someone called it oxo-biodegradable, someone called it totally degradable plastics and someone even called they biodegradable) are not BIO-DEGRADABLE.
 3. Degradable bags are like normal garbage bags or normal non-recyclable waste (also non organic waste) which then go to landfill or burning/incinerating. However, since these bags have no chance to be exposed to sun light (in fact should be Ultra Violet light) for long time, therefore, the chance to be degraded is very low, if not impossible. In such case, degradable or non degradable is meaningless and makes no difference. If these bags are for incinerating, then other than the issue of burning plastics which may have risk of emitting toxic substance such as Dioxin, again it makes no difference whether the bag is degradable or non degradable. So again, what is the point of making a very good performing and with great recycling value bag degradable?
 4. Since light, strong heat source are critical to the decompose of a degradable plastics to become numerous small fragments, does it mean you need to have these bags to be in the wild in order to have chance to be exposed to sunlight? So does it imply you are not going to recycle the bags but thrown them away after use? Is such throwing away behavior an eco-friendly behavior?

As degradable plastic is not a complete degradation process in short period of time, therefore, such partially degradable plastics will create numerous smaller fragments in the wild. With the wind blowing, you can image how these smaller fragments being scattered everywhere, rivers, agriculture lands, reservoirs, sea shores, etc. You can image as well if fishes in the river and those marine lives eat them. According to **Science 2004**, these fragments have been steadily accumulated in the ocean, and, Flotsam Lab experiments showed that marine animals consume microscopic bits of plastic, but remain and accumulate in the digestive tracts of these marine animals.



5. According to **Algalita Marine Research Foundation's report**, plastic scraps can attract and hold hydrophobic elements like DDT & PCB up to one million (1,000,000) times background level. As a result, floating plastic resulted from those partially degradable plastics are like a "poison pill" - which are endocrine disruptors.
6. According to **Mato et al Environ. Sci. Technol 2001, 35, 318-324**, PCBs, DDT and nonylphenols (NP) were detected in high concentrations in degraded PP resin pellets collected from 4 Japanese coasts, and plastic residues from partially degradable plastics function as a transport medium for toxic chemicals in the marine environment.

Followings are the tests which applies to Biodegradable Plastic which Biodegrades with or without Sun Light AND/OR Moisture under any climatic Conditions.

ASTM STANDARD	TEST
D 5208-01	PHOTODEGRATION BY EXPOSING TO UV LIGHT FOR 200 HOURS.
D 5208-91	PHOTODEGRATION BY EXPOSING TO UV LIGHT FOR 200 HOURS.
5209 -92	UNDER AEROBIC BIODEGRADATION IN PRESENCE OF MUNICIPAL SEWAGE SLUDGE .
D-5338-92	BIODEGRADATION BY CULTURE OF FUNGUS ASPERGILLIS NIGER AND UNDER ACCELERATED COMPOSTING CONDITIONS.
5338-98	UNDER AEROBIC BIODEGRADATION CONTROLLED COMPOSTING CONDITIONS.
21-96	UNDER ANAEROBIC BIODEGRADATION CULTURE TEST USING FUNGUS ASPERGILLIS NIGER.
94A, 5526 -04	UNDER ANAEROBIC BIODEGRADATION UNDER ACCELERATED LAND FILL CONDITIONS.
USP 31 (PAGE NOS 104-107) ISO 10993-10	INTACUTANEOUS TEST.
USP 31 (PAGE NOS 104-107)	ORAL TOXICITY TEST .