Things To Know About Oxygen Absorbers

Perhaps the second most important decision to make when freeze drying, after picking whether you are storing your food in glass jars or mylar, is what oxygen absorber should I be using and how can I tell if they are doing their job? Before you worry about brand, it is important to understand the role OA's (oxygen absorbers) play in long term food storage, how to determine if your OA is working, and how to tell if your OA is "good" before sealing it in for the long haul.

Why do I need to use oxygen absorbers to store freeze dried food long term?

First and foremost OA's absorb **OXYGEN** not air! The air on Earth is composed of many gasses, but the two most prevalent are nitrogen at about 78% and oxygen at about 21%. The role of the oxygen absorber is to remove the oxygen from your stored food, allowing the nitrogen to help preserve the food's nutrients, color, and flavor. Things like bacteria, mold, and insects need oxygen to grow, so if you remove the oxygen from your stored food it is less likely to grow mold and bacteria, and insects cannot survive without oxygen.

My bag does not look vacuum sealed, is my OA working?

Using an OA is not the same as vacuum sealing. If air is only 21% oxygen, then when using an OA you are only removing 21% of the gasses from the bag. If you are packaging warm food straight out of your freeze dryer, then the air in the bag expands because it has increased energy. If you put your OA in the bag while the food is still warm and seal it, then the food and air will cool down after sealing, and the gasses condense taking up less space. Then the OA removes the oxygen, remember it takes several hours for the OA to reach peak absorption rate. In this situation it may look like you have vacuum sealed the bag, especially if you worked to remove as much extra air as you could before you sealed the bag.

If you store food in glass jars, or bags for a couple of hours to a couple of days, before adding an OA and sealing your product, the food is not warm, the air is not warm, and your bag more than likely isn't going to suck down and look vacuum sealed. As long as your bag doesn't look like it is tight and blown up like a balloon from gasses being created (from mold and bacterial growth), more than likely your OA is doing its job.

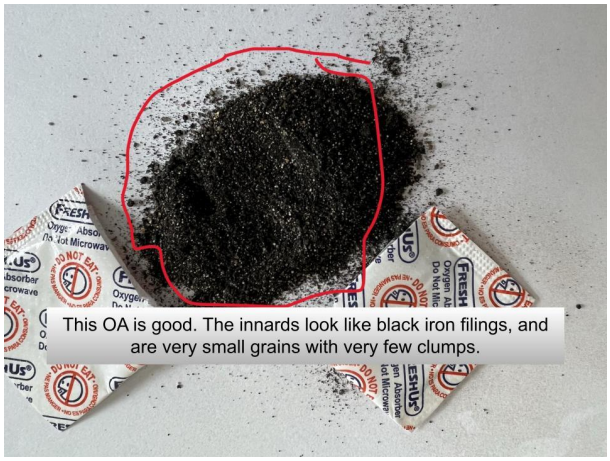
How fast do I need to work with my oxygen absorbers before they go bad?

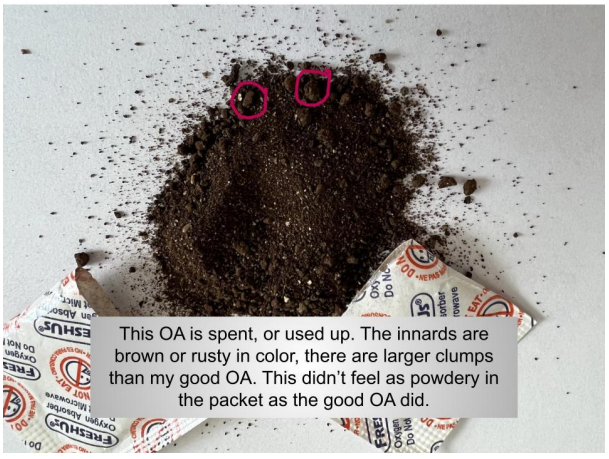
OA's work slowly to start. They will hit a peak absorption rate several hours after being exposed to air. They will continue working at that rate until either the oxygen is absorbed or the iron in the OA has been completely used. What this means for you as you are packaging your freeze dried food is that while yes you want to move quickly, if your OA's are exposed to the air for 15-20 minutes while you are working they will still work just fine. Before you use your OA it is important to make sure that the food is well packaged. If so, the OA will do its job.

How can I tell if my OA is good?

The first thing you should look for when using a new package of OA's is making sure that the package it came from looks vacuum sealed. If the package doesn't look vacuum sealed the package has most likely had a slow leak and the OA's are spent. If you open those packages, the OA will be inflexible (if you try to bend it, it may even break open). It won't feel like a very fine powder is inside, but rather a super gritty sand, or completely solid. These are all indications of bad OA's that need to be discarded.

Next, look at the indicator within each package of OA's. These indicators indicate whether or not the OA's have been exposed to oxygen at some point in time. They should all be pink in color, which is the sign of good OA's that are ready to be used. I will note that I have received packages of OA's with the indicator showing some purple dots on a pink background, or the indicator is a very light purple, not pink, and these are still good OA's. But if you see a darker blue/purple indicator, it means it was in a leaky package and the OA's should be discarded.


This OA is good. The innards look like black iron filings, and are very small grains with very few clumps.


This OA is spent, or used up. The innards are brown or rusty in color, there are larger clumps than my good OA. This didn't feel as powdery in the packet as the good OA did.

In general, if it isn't dark blue/purple, the bag looks vacuum sealed, the individual OA's are flexible and feel like they are filled with a fine powder, those OA's are **more than likely** safe to use. If that makes you uncomfortable there are two things you can do. First, you can decide not to take the chance with it and discard the OA's in that package. Or, you can test the OA's from the package. Open the package and take out one of the OA's. Seal the rest back up and wait on the results from your test to use the OA's (We will go into how to test your OA's at the end of this blog, along with an embedded video of how to test your OA's). They may still absorb plenty of oxygen and can still be used for storage.

Do I need to wait until I have enough packages to use all of the OA's at once or can I reseal the package of OA's?

First, I would highly recommend buying OA's that come in packages of 10 maximum. For example, Freeze Drying Supplies (www.freezedryingsupplies.com) sell 50 OA's that are shipped to you as 5 packages of 10. (The OA's sold by Freeze Drying Supplies are what I tested in my Oxygen Absorber Experiment video)

Only exposing 10 OA's at a time makes it likely that you will only work with the OA's 1-2 more times after working with them the first time, thus limiting the number of times they are exposed to air. If you are packaging less than 10 bags or jars of food at a time you are likely not exposing your OA's for extended periods of time so they never hit peak absorption.

You can reseal the OA's in the bag they came in with your impulse sealer. These bags keep the oxygen out of your OA's while they have been waiting to be used, so if properly sealed again, should keep your OA's good going forward. As added protection, you can put that sealed bag into a mylar bag and seal that bag at the very top with your impulse sealer. Then when you need OA's again, cut right next to the seal, pull out your OA's. You can use that same mylar bag to store OA's in 10-12 times if you keep your seals

tight to the top and reopen them near the seal. **IF you put OA's in a jar (I don't recommend this) you MUST vacuum seal that jar or oxygen will get into your OA's and they will be used up.**

If you are running back to back loads in your freeze dryer, and will have 10 packages to seal within a day or two…go ahead and either jar or bag your food now and add the OA when all are packaged. This way you can add all of your oxygen absorbers at once and impulse seal or vacuum seal your bags/jars. It is safe for the short term to not have an OA in your completely dry food.

Do I need to use an OA if I am vacuum sealing my jars or bags?

This question draws a lot of different answers, but actually yes, you should still use OA's in your vacuum sealed jars and bags. While vacuum sealing does remove almost all of the air in a package, it does not necessarily remove 100% of the air, or oxygen. Even a small amount of oxygen can allow mold and bacterial growth.

How can I test my OA's if I am not confident they are still good?

Adventures in Freeze Drying: The Oxygen Absorber (OA) Experiment!

Testing OA's is actually a pretty fun activity. And if you add a little food coloring to the water bath you'll use, you can call it a magic trick to entertain young kids, or a science experiment to figure out what is going on with older kids!

You will need a 16 oz glass or pint/quart jar, some double stick tape or masking tape rolled sticky side out, a flat bottom pan, water, an OA, and

food coloring if desired. If you want to figure out how much Oxygen your OA's are pulling out, you can also use a kitchen scale to help with this.

1. If you want to know the amount of Oxygen your OA's are absorbing follow paragraph a below, if not skip to step 2.
    a. Pulling out my physical science and measurement knowledge I know that 1 gram of water has a volume of 1mL of water. So, fill a jar or glass up to the very top with water, then weigh it to find its mass in grams. Then start dumping some water out until you get a new mass that has decreased by 100 grams from your initial weight. By doing so, you have then reduced the volume in your glass or jar by 100mL. Thi,s is equivalent to 100 cc's of water or more importantly oxygen. Mark this level on your jar or glass… (I was able to remove Sharpie from my jars using dish soap and a washcloth.) This will help you determine how much oxygen will be absorbed.
2. Place your double stick tape (or rolled masking tape) to the back of your OA and tape it to the inside bottom of your glass or jar.
3. Add about 1-2 inches of water in the bottom of your flat bottomed pan (a square cake pan works great for this). You can add food coloring to the water if desired to make it easier to see the level of the water but it is not necessary.
4. Move your flat bottomed pan to a place where you can let it sit for 12-48 hours. You can stop the experiment after 12 hours if you are only trying to decide if the OA is still working or not. If you want to know how much oxygen they will remove compared to their stated capacity, continue the experiment for up to 48 hours.
5. Flip your glass or jar over, and slowly set it upside down in the pan of water. Try to place it such that the entire rim of the jar touches the water at the same time, not at an angle. The water will push out from the jar or glass as you put it down because the jar is full of air.
    a. Now be patient… the first 100mL will take awhile, this is because it takes several hours for the chemical reaction to reach its peak absorption rate. Then it takes more time for the first 100 cc's of oxygen to be absorbed.

b. If you are only interested in knowing whether or not the OA is doing its job, you can stop the experiment once you see the water level approaching that 100mL line.
c. If you want to know how much oxygen your OA will in fact absorb, continue on. During the experiment, every time the water reaches that 100mL line, lift the glass or jar out of the water bath to release the water back into the pan. Refresh the air in the jar either by waving it around a little or by blowing into the glass or jar to add more air/oxygen into the jar. Then set it back down in the pan. Keep track of how many times you empty the jar to know how many cc's of oxygen were absorbed.

This information is shared from what I have learned. It is not intended to be your ONLY information about OA's. You should still do your own research to make sure you understand and know when your OA's are good and doing their job.