

## 小贴士 如何选取合适的实验室喷雾干燥机

“工欲善其事，必先利其器”，针对不同的物料的物理性质或化学性质，以及实验需要得到的粉末或颗粒的大小和溶解性等，科研人员可能需要不同类型的实验室喷雾干燥机，才能得到最理想的实验效果。

Sharp tools make good work. In view of different physical properties, chemical properties as well as powder or particle size and solubility required, research personnel may need laboratory spray dryers of different types with respect to ideal experiment results.

### 1) 含糖份比较高（如果汁，中草药或天然产物提取物）或热敏性的物料

#### 1) High carbohydrate-containing (e.g. fruit juice, Chinese herbal medicine or natural product extracts) or thermo-sensitive materials

因为大部分多糖双糖，熔点比较低，在受热的时候，糖分发生了融化，而且多糖双糖本身比较容易吸潮，所以普通的喷雾干燥机，就会很容易出现黏壁的现象，不容易得到好的干粉或颗粒。另外，像酶制剂，活菌以及一些在高温下比较容易变性的高分子材料等，使用普通喷雾干燥机，物料极易失活或变性，这时，降低喷雾干燥机的进风温度和出风温度，就能得到比较好的实验效果，上海雅程仪器设备有限公司的YC-1800实验室低温喷雾干燥机和YC-2000实验室低温喷雾干燥机能够在比较低的进风温度进行试验，比如，YC-1800实验室低温喷雾干燥机的进风温度可以设置为110℃，一般的含糖量高的物料，都能得到比较好的颗粒。有些物料的糖分，可能熔点更低，而YC-2000实验室低温喷雾干燥机，在60-80℃的进风温度，就能完成喷雾干燥机过程，像酶制剂，活菌等，在这样低的温度下瞬间干燥，活性完全不受影响。

As most polysaccharides and disaccharides have a low melting point and carbohydrates melt when heated, and polysaccharides and disaccharides are easy to absorb moisture, general spray dryers are likely to experience sticky wall and find it difficult to get good powder or particle. In addition, enzyme preparation, viable bacteria and polymer materials easy for denaturation under high temperature are subject to inactivation or denaturation when general spray dryers are used. If inlet and outlet air temperature is reduced at this moment, better experiment effects can be achieved. YC-1800 Laboratory Low-temperature spray dryer and YC-2000 Laboratory Low-temperature dryer of Shanghai Yacheng Instrument & Equipment Co., Ltd can carry out experiments at low inlet air temperature. For instance, YC-1800 Laboratory Low-temperature dryer can make its inlet air temperature at 110℃ and generate satisfactory particles for general high carbohydrate materials. Some carbohydrates may have a lower melting point, but YC-2000 laboratory low-temperature dryer can complete drying at a 60- 80℃ inlet air temperature. Materials such as enzyme preparation and viable bacteria are not affected in activity at such a low temperature.

### 2) 溶媒为有机溶剂或易氧化的物料

#### 2) Materials with organic solvent or oxidizable materials

喷雾干燥中含有有机溶媒物料干燥难的问题，一般有机溶媒会呈易燃易爆的特性，防爆型闭式实验室喷雾干燥机使物料能在密闭的干燥系统中循环，整个系统充满了惰性气体（如氮气或氩气），可避免有机溶媒气体与外界氧空气的接触，确保了安全生产。上海雅程YC-015A实验型有机溶剂喷雾干燥机采用的是安全性的氮气（或其他惰性气体）密闭循环方式，整个系统全封闭状态，含氧气浓度在线监控，系统内氧气浓度一旦达到1.5%，系统会自动强制性停机并报警，是安全性好、操作简便的实验室有机溶剂专用小型喷雾干燥机，通过氮气密闭循环方式及采取溶剂完全回收方式的并用可对具有可燃性、毒性的溶剂进行处理，并可进行易氧化物质的干燥。而且，由于有机溶剂的沸点低，因此可以用低温干燥方式对易发生热变性的物质干燥。

Spray drying usually encounters difficult organic solvent material drying. General organic solvents are flammable and explosive, and anti-explosion closed laboratory spray dryer makes materials circulate in closed drying system and protect organic solvent gas from external oxygen and air, which guarantees safety production. Yacheng YC-015 experimental organic solvent spray dryer adopts safe nitrogen (or other inert gas) closed circulation so that the entire system is in a closed state under online monitoring and control of oxygen concentration. When system oxygen concentration reaches 1.5%, the system will automatically resort to shutdown and alarm. YC-015 is a safe and simple laboratory organic solvent special small spray dryer which disposes combustible and poisonous solvents via closed nitrogen circulation, complete solvent recovery as well as oxidizable material drying. Also, as organic solvents have a low boiling point, low temperature drying can be used to dry materials prone to thermal denaturation.

### 3) 需要得到大颗粒粉末的物料

#### 3) Materials needing big grain powder

在一些实验过程中, 科研人员希望得到一些大颗粒的样品, 比如催化剂行业, 一般需要100微米左右的颗粒才能有比较好的催化效果, 但是普通的喷雾干燥机, 只能得到30微米以下的颗粒, YC-1000实验室喷雾干燥造粒机, 就能比较好的达到实验目的。YC-1000喷雾造粒机, 既可以用单独的喷雾干燥机, 得到100微米左右的颗粒, 还能实现小颗粒粉末的造粒, 能得到100微米以上的大颗粒。

In some experiments researchers expect big grain samples. For example catalyst industry typically requires 100-micron particles with respect to satisfactory catalytic effect, but general spray dryers can only produce particles of no more than 30 microns. YC-1000 laboratory spray dryer can better achieve experiment purpose. YC-1000 spray granulator can both serve as a spray dryer alone to get 100-micron particles and achieve small grain powder granulation of more than 100-micron large particles.

### 4) 热敏性极差或需要改良溶解性的物料

#### 4) Materials of thermo-sensitivity or needing improved solubility

有的物料, 基本不能受热, 传统的冷冻干燥时间又非常长, 而且干燥后的物料成块状, 流动性差, 溶解性也不是很好。与传统冷冻干燥技术相比, YC-3000型实验室喷雾冷冻干燥机具有以下优点: (1)雾化分散的细小液滴浸入低温中迅速冻结, 能弱化冰晶的生长, 减小冰晶对脂质体的破坏, 避免药物的渗漏和突释; (2)冻结样品经真空干燥后形成具有微孔结构的球形微粒, 流动性好, 且微粒的大小可以通过改变喷雾工艺来调节。YC-3000型实验室喷雾冷冻干燥机适用于热敏性、粘稠性、活性物料及含糖量高的物料的低温干燥, 如中草药天然产物提取液、乳制品、生物制剂、酶制剂、水果原汁、高分子材料等。

Some materials can barely withstand heat with long traditional freeze drying time, and dried materials are in bulks of poor liquidity and solubility. Compared with traditional freeze drying technologies, YC-3000 laboratory spray freeze dryer has the following advantages. (1) Atomized and dispersed small droplets immediately freeze under low temperature, which weakens crystal growth, cushions crystal damage to liposome, and avoids drug leakage and burst release. (2) Frozen samples form porous spherical particles after vacuum drying with good liquidity, and particle size can be adjusted by changing spray process. YC-3000 laboratory spray freeze dryer is suitable for low temperature drying of thermo-sensitive, viscous, active and high carbohydrate materials such as Chinese herbal medicine natural product extract, dairy product, biological agent, enzyme preparation, fruit juice and high polymer materials, etc.

对于需要直接得到纳米材料的物料, YC-3000型实验室喷雾冷冻干燥机也是一个极好的选择。

For materials with direct need for nano materials, YC-3000 laboratory spray freeze dryer is also a very good choice.

### 5) 常规的物料

#### 5) Conventional material

一些实验室用于常规粉末的制备或物料的干燥, 可以选用YC-015实验室喷雾干燥机, YC-015体积小, 速度快, 噪音小, 操作简便, 而且20ML的料即能完成一次实验, 干燥出来的粉末球形度好, 颗粒大小成正太分布, 特别是该机带有喷雾头水冷装置和塔壁吹扫功能, 极大的扩展了实验室喷雾干燥机的应用。

Certain laboratory conventional powder preparation or material drying can choose YC-015 laboratory spray dryer due to its small size, fast speed, low noise and easy operation. In addition, 20ml materials can complete one experiment with dried powder of desirable spherical formation and normally distributed particle size. What's worth mentioning is that this type has spray head water cooling device and wall purging function, which greatly expands application scope of laboratory spray dryer.