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APPLICATION NOTE

Homogenization & Characterization of Cannabidiol (CBD) Isolates

Background

Solid isolates of CBD may be created as a non-homogenous "cake" of material, or as a mixture of loosely associated granules comprising a wide particle size distribution. Creating material suitable for consumption or subsequent formulation in other products, typically requires particle size reduction and/or homogenization. Confirmation of particle size distribution of a given sample may be achieved via traditional sieving methods, or by use of a particle size analyzer.

Milling

Primary considerations when selecting a milling system for CBD homogenization include:

- Batch size (throughput requirement – kg/batch or day)
- Minimizing losses (physical and/or chemical)
- Desired final particle size range
- Ease of cleaning to prevent batch cross-contamination

Small-scale (< 1 kg) homogenization of CBD isolate may be achieved by low-energy ball milling, or by automated mortar & pestle. Batches exceeding 1 kg may be processed in a continuous manner by using the PULVERISETTE 14 *classic line* variable speed rotor mill, with Cyclone sample collector.

Fig. 1: Inside of PULVERISETTE 14 rotor mill, showing fixed collection pan, rotor, and sieve ring. High performance Cyclone sample collector in stainless steel is shown on the right. Used together with modified collection pan, the P14 system & Cyclone allow continuous feeding & homogenization of CBD material into the low micron range (consistency of talcum powder).

Configured as a continuous milling system, the P14 with Cyclone allows continuous feeding of material, and active removal of material from the rotor area – typically within a fraction of a second. Because the homogenization occurs so quickly & the material actively removed, there is no time for frictional temperature increase to occur that could cause chemical degradation. Product contact surfaces are stainless steel, or food-grade plastic vacuum hose for the Cyclone, and can all be cleaned thoroughly between batches to reduce the likelihood of cross-contamination. Variable speed motor & range of sieve rings, provides control of particle size output.

Particle Size Analysis

Characterizing the particle size distribution of a sample may be performed for the following reasons:

- To confirm that a milling system has achieved particles within an accepted range
- In Quality Control: As a criterion for release into the manufacturing process (raw material testing) or for product sale
- In R&D: To study the efficacy of a compound based on its particle size, and/or on the perceived quality of a formulated product

Particle size analysis by traditional sieving methods involves passing the material through a series of sieve pans with progressively smaller openings, and calculating the weight of material that is retained in each pan. Data obtained by using this method is limited by the number of different sieves that are used, and can be confounded if & when particles stick to the metal surfaces.

Laser particle size analyzers with reverse Fourier optical system, pioneered & patented by FRITSCH over 35 years ago, have become a world-wide standard across a wide range of industries, for precise size characterization of materials down into the low nanometer range. The ANALYSETTE 22 NanoTec Laser Sizer has been used successfully to characterize CBD isolates, using either a wet or dry dispersion method.

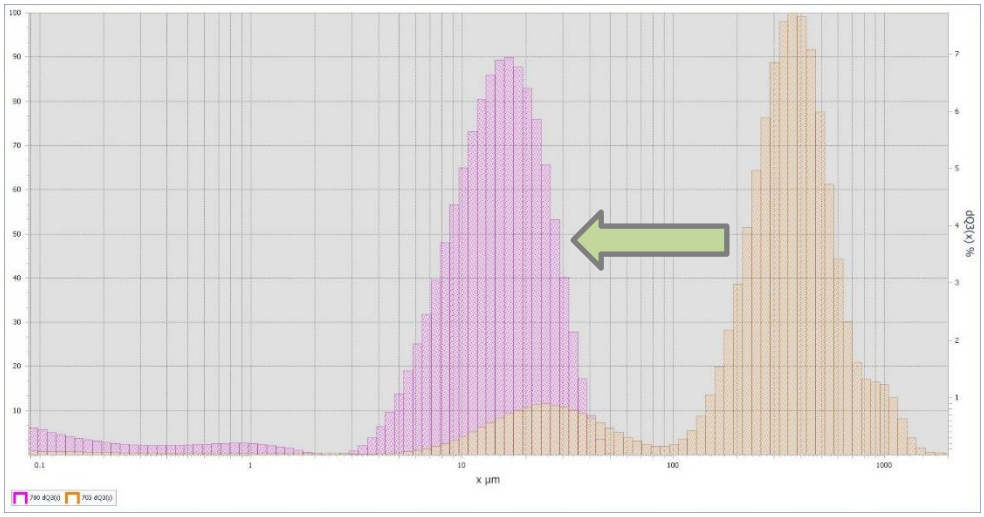

Fig. 2: The ANALYSETTE 22 NanoTec was used to measure CBD isolate before & after homogenization. Starting CBD sample (orange) contained a mixture of loose granules with a wide particle size distribution. Material homogenized using the PULVERISETTE 14 *classic line* variable speed rotor mill (purple) resulted in a particle size consistency similar to talcum powder.

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