

Spectrophotometers are ideal for producing accurate, repeatable color measurements of virtually all types of materials, from the [purity of white in a sheet of paper](#) to the [dynamic hues of thermochromic plastics](#). Often, however, spectrophotometers and spectrophotometric accessories are designed to measure a substantial quantity of material, compromising the ability of those working with scarce or expensive resources, such as rare grains or costly pharmaceuticals, to obtain reliable readings via standardized equipment.¹ Additionally, in recent years economic, environmental, and health-related concerns have spurred a move toward miniaturized sample preparation protocols within many industries, creating [newly refined methodologies](#) that rely on small sample analysis unsuitable for traditional measurement techniques and instrument set-ups. As Francisco Pena-Pereira writes:

Analytical chemistry researchers are concerned about the use of conventional protocols, which are generally large-scale, tedious, time-consuming, require manual labor and involve the use of large quantities of hazardous reagents. Thus, the development of new miniaturized procedures has become necessary due to the increasing demand for environmentally friendly, green, fast and alternative approaches.²

At HunterLab, we have responded to our customers' need to [measure small samples](#) by creating a range of spectrophotometric technology and spectrophotometric accessories that give users the ability to produce accurate color measurement even when working with minute substances, allowing for adherence to the most modern methodologies, preserving scarce materials, and reducing costs.

Reflectance Measurements of Solid Samples

When measuring a solid sample, the area of measurement is determined by the size of the spectrophotometer's port opening. Many HunterLab spectrophotometric instruments, including the [LabScan XE](#) and the [UltraScan Pro](#), give users the options of switching between the normal port opening size (Large Area of View, or LAV) to a Small Area of View (SAV) mode specifically designed for accurate measurement of small samples. Depending on the instrument, the port may be as small as 3-4mm. To ensure precise alignment, we fit our instruments with a [retroviever](#) that allows you to see the sample as the instrument sees it, giving you the highest level of sample placement control. This is particularly critical when working with small samples, as you must avoid inclusion of background color information that may interfere with the accuracy of your measurement.

Reflectance Measurements of Powder Samples

Powders inherently present special challenges for color measurement, as their non-uniform nature, susceptibility to light trapping, and sensitivity to ambient light make them vulnerable to inaccurate analysis. In order to minimize these effects, the [sample must be prepared with sufficient thickness](#), which can be difficult when working with a small amount of material. HunterLab offers a semi-micro powder sample accessory that simplifies sample preparation and allows for the accurate analysis of powder samples as small as 0.4cc when used in concert with our specialized SAV port plate.

Transmittance Measurement of Liquids

For color and haze measurement of small liquid samples, our spectrophotometers can be used with a number of specialized small volume cells ideally suited to working with limited sample sizes. Our 10mm round cell, for example, is an optically clear, manual loading transmittance cell made of borosilicate glass. Originally developed to allow pharmaceutical researchers to minimize the sample size of [expensive drugs](#), these cells enable accurate analysis of all types of small liquid samples and are equipped with both an inject-a-cell top and a solid propylene top, rendering them capable of handling both stable and volatile liquids. We also offer a semi-micro cell holder and optical assembly compatible with a 10-mm (0.4 mL) or 20-mm (0.8 mL) path length semi-micro cuvette to optimize accuracy. The semi-micro cell holder is designed with beam-reducing

optics that reduce the size of the light source beam from 17.4 mm to 3 mm to read color data within the micro-sample, then expands the beam back to 17.4 mm to be captured by the detector.

Full article with photos available here:

<https://www.hunterlab.com/blog/color-measurement-2/applying-appropriate-spectrophotometric-technology-and-accessories-for-small-sample-analysis/>