

RESULTS FOR PARTICLE SIZE ANALYSIS OF COLLOIDAL SUSPENSION

Plant Derived Minerals
from Senonian Vegetate

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The Plant mineral sample supplied is very complex and quite unusual in its properties. I am confident in the accuracy of the methods applied to this mineral sample but due to the nature of the sample, certain ambiguities currently exist in the interpretation of the results. However I can propose several rather significant possible explanations for the results.

Two methods were applied to determine the particle size of the species present in the sample. These methods were laser light-scattering and field-flow fractionation.

Laser light-scattering is based on the fact that particles move about in solution due to random bombardment by water molecules. The smaller the particle (colloid) the more it moves. If we shine a larger beam through a suspension the particles present will scatter light. The intensity of the scattered light depends on the combined scattering of the many thousands of particles present in the region of the sample where the laser beam passes. As the particles move about in the suspension the intensity of scattering changes. If the particles are small they move about rapidly so the scattering changes rapidly. If they are larger they move more slowly and therefore the scattering intensity changes more slowly. We can determine the size by examining how rapidly the scattering intensity is changing. The disadvantage of this technique is that the results are always dominated by the larger particles because scattering intensity increases with particle size. The results for a standard and the plant mineral samples were:

Standard	certified value	0.87 micron
	measured value	0.92 +/- 0.02 micron
Sample	measured value	0.46 +/- 0.04 micron

Based on my observation of the very low scattering intensity for the sample and the known effect of a few large particles making the smaller ones I believe this result to be much too large. This result is also inconsistent with the observation that essentially no color was removed from the sample by filtration through a 0.1 micron filter.

Field-flow fractionation (FFF) is a chromatography-like method where particles and colloids are separated based on size. This separation is based on hydrodynamic forces which arise when fluid is passed through a very thin (0.25 millimeter) rectangular channel. In the type of FFF used for this sample small colloids come out of the channel before larger ones. In the analysis a small amount of sample is

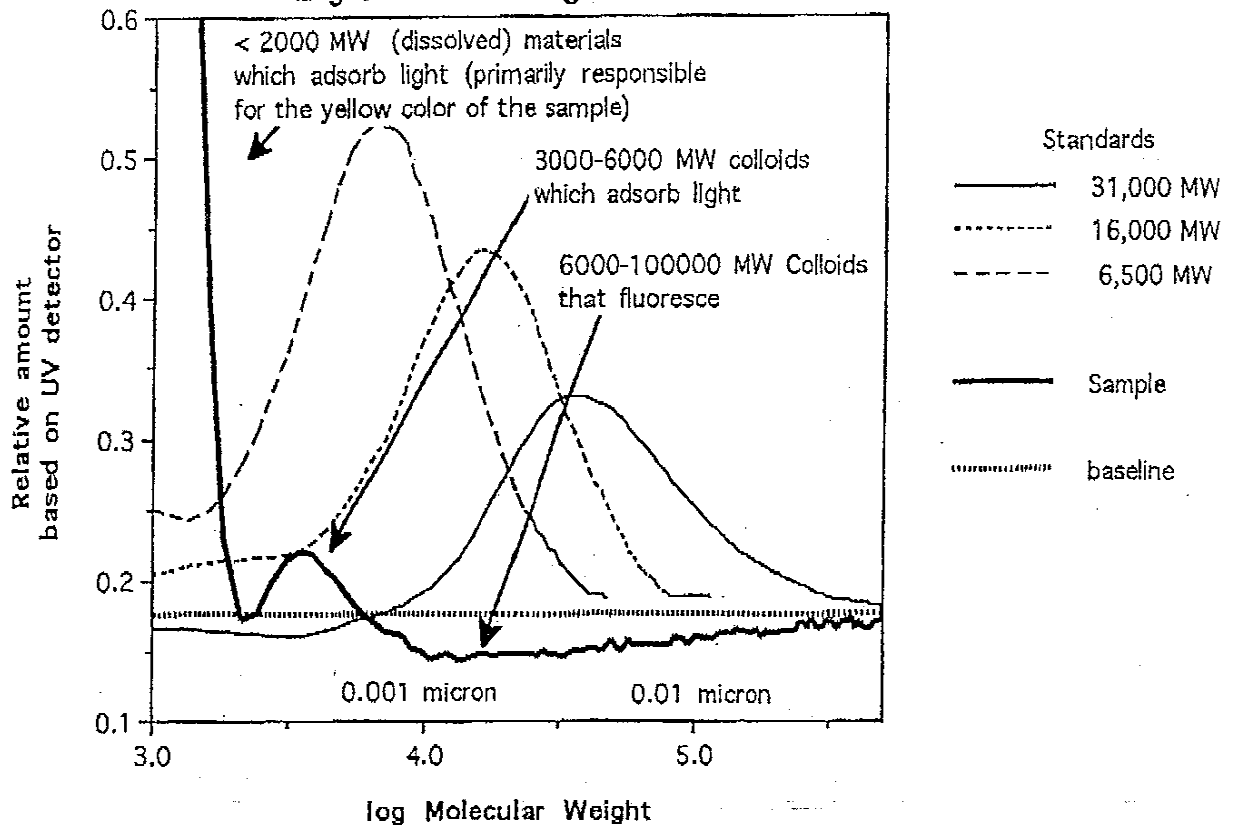
injected into the channel flow and this flow is then passed through a UV absorbance detector. As the colloids elute they generally are detected by their UV absorbance. A series of standards of known size or molecular weight are generally run to obtain a calibration curve which is used to convert the time it takes a colloid to come out to a size or molecular weight. The results of these analyses are plots of the detector response versus the size or molecular weight of the colloids, with size increasing along the x-axis. For most environmental samples, including solutions obtained from soils, peats, and surface and groundwaters, the UV absorbance is proportional to the amount of particles present in any given size. This plant mineral sample however is not only complex but quite unusual and this relationship is not exactly true in this case.

FFF results are shown in two accompanying figures. The first figure shows the calibration curve for the polystyrene sulfonate standards used to calibrate the FFF. The molecular weights of the standards were 6,500; 16,000; and 31,000. This corresponds to a size range of roughly 0.002-0.01 microns. This calibration curve was used to determine the size of the unknown samples. The standards are plotted on the same graph as the sample, for comparison purposes.

The plant mineral sample is very different in its properties from environmental samples I have previously examined. There is considerable material less than 2000 molecular weight that strongly adsorbs light present in the sample. This is not unusual for these types of samples. This is material, which gives the sample its yellow color. This is typical of dissolved organic material such as one finds in a peat bog and is consistent with a solution obtained from organic-rich shale. Any metals present in the <2000 molecular weight size likely exist as either dissolved metals and / or metals chelated to this dissolved organic matter. A second peak of small colloids appears between 3000-6000 MW (about 0.001 microns). A somewhat more mysterious weakly negative peak (absorbance less than the baseline) occurs over the region of about 6,000 to 300,000 molecular weight (0.001 to 0.1 microns). This is quite unusual and I have never seen this in natural organic matter samples before.

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Graph of Standards and Sample
relative amount versus
Log Molecular Weight

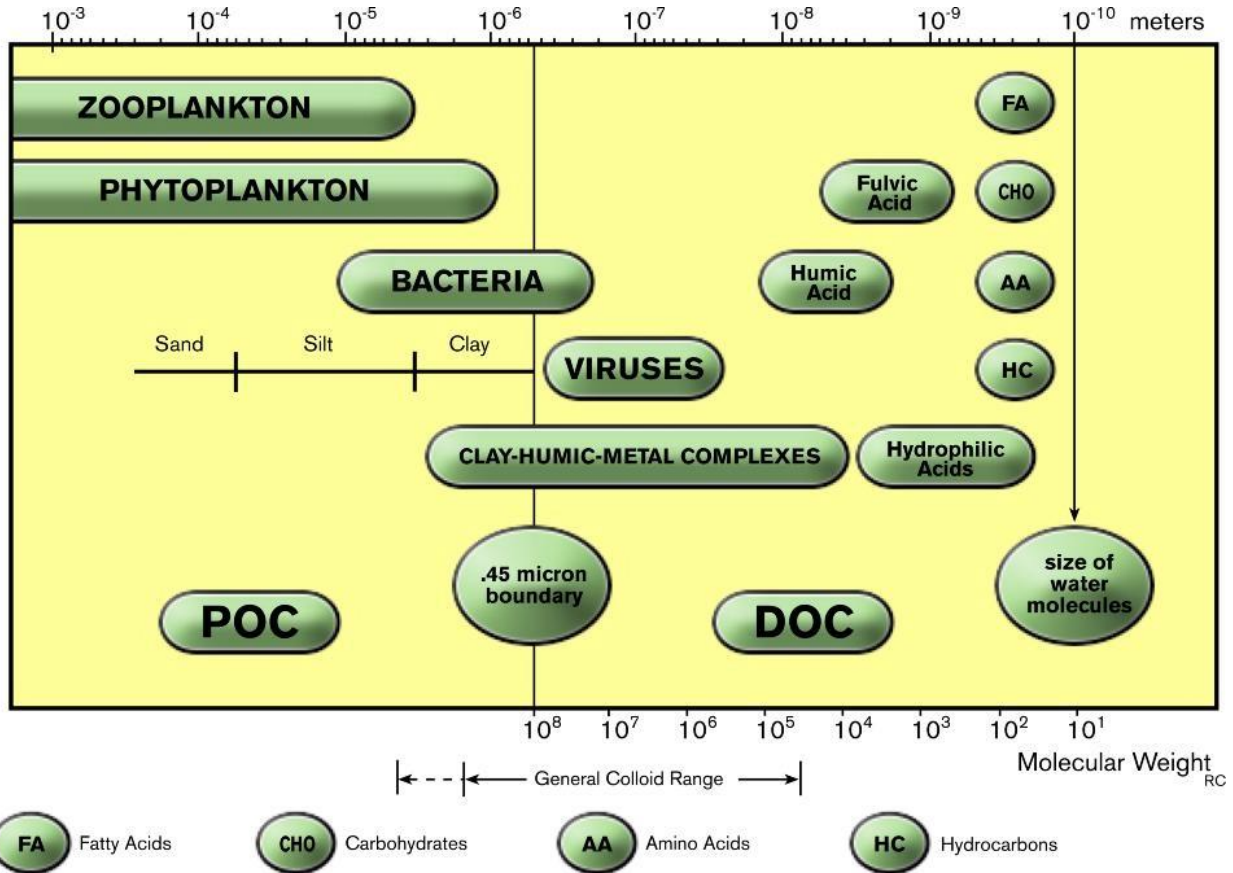


Organic Continuum Chart

Explained By: Elmer Heinrich

The scale graph below was obtained from Dr. Ranville of the Colorado School of Mines. It demonstrates how hydrophilic complexes such as plant minerals are relatively 100,000 times smaller than hydrophobic metallic minerals.

Plant minerals like those obtained from tomatoes, broccoli, potatoes, oranges, etc., are different than metallic minerals. Their size and molecular weight is much smaller than metallic minerals and in most cases the plant minerals are attached to a different molecule even though they possess the same name. (I predict that the scientific industry will change the name of plant minerals in the future. That will occur after they eventually realize plant minerals are no longer metal elements.)



Basically, the scale reveals that clay, silt and hydrophobic metallic minerals, on average, are considerably larger than hydrophilic acids or hydrophilic plant minerals. The figures at the top from left to right are measurements in microns. As an example, 10^{-4} is 10 times smaller than 10^{-3} , and 10^{-9} is 10 times smaller than 10^{-8} , etc. The exponent of 10^{-9} clearly indicates that hydrophilic complexes such as hydrophilic plant derived minerals are nearly 100,000 smaller than 10^{-6} bacteria, viruses, clay and humic

metal complexes. Pure, properly extracted plant minerals can be pumped through a pharmaceutical grade .02 micron absolute filter. Most metallic minerals will not pass through this small membrane. Only the water passes through. Note: a water molecule is only slightly smaller than hydrophilic complexes. The small size and water solubility is one of the reasons so many nutritionists believe plant minerals are much easier to assimilate or absorb than metallic minerals. The bottom portion of the scale relates to the weight of the particle, which is measured in atomic mass units or AMUs or Daltons. A Dalton is a measurement of molecules and atoms. When reviewing the scale, it is plain to see that the molecular weight of hydrophilic is considerably less than metallic complexes. In short, this clearly indicates there is as much difference in generally known “colloidal minerals” and “plant derived colloidal minerals” as day and night.

Each company in the mineral business has the responsibility to provide you, the customer, with substantiated tests from certified laboratories, on the laboratory’s letterhead, bearing the signature of a certified chemist. You must ask for it. It may even be advisable to verify that the test is authentic because I know of several which are not. At best, do not settle for an analysis, which comes to you on the sales companies’ letterhead. Also, at your request, they should allow you to visit their mine source and processing and bottling facility. If they are reluctant to do this, they are probably afraid of their sanitary conditions or as being exposed as being frauds in some areas of the business.

I believe that many of the articles written about colloidal minerals were the result of overzealous sales tactics within the health food supplement industry. Much of the mineral controversy came about because of the unbelievable claims and outright lies about the benefits of minerals. True, minerals are probably deficient in nearly 100% of our population, but minerals are not the answer to all health problems. Without them nothing else would benefit, but the average person in the business doesn’t tell his potential customer this for fear of losing a sale. We must remember that in order for minerals to provide their utmost benefit, we may need to make some lifestyle changes. This may include a food selection change; better drinking water; more stretching and exercise; less stress; more rest; less smoking or drinking; and the intake of considerably more usable oxygen. Don’t be misled. A complete spectrum of minerals is the benchmark for ultimate and total nutrition, but not the total answer to protracted health.

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