Particle Sizing of Tap and Bottled Water

Water has great importance in human life. While water composes a majority of the Earth's surface, only a small percentage is readily available for consumption. Safe, drinkable water is important for a healthy society. This does not mean water needs to be 100% free of impurities. Some impurities can be added naturally or artificially for health and safety reasons. Important minerals like magnesium and sodium ions occur naturally in the water supply. Trace amounts of chlorine can be added to control the growth of harmful microbes. Even bottled water may contain impurities, which are typically artificially added minerals or leeched material.

Measuring the size of the particles in water can be accomplished using particle size analysis based on laser diffraction technique. Light refracted by a particle creates a scattering angle unique to its shape and size. The intensity of the scattering light is measured by an array of light detectors at different angles. The Mie Theory is the preferred method used to relate the measured scattering angle to the particle diameter.

Table 1 Particle Size Results for Tap Water Based on Volume, Surface Area and Number

Test	Size Based on Volume (µm)	Size Based on Surface Area (µm)	Size Based on Number (µm)
1	5.883	3.825	2.347
2	5.072	3.586	2.291
3	7.138	4.173	2.456
Ave.	6.031	3.861	2.365
S.D.	1.041	0.295	0.084

Table 2 Particle Size Analysis for Bottled Water Based on Volume, Surface Area and Number

Test	Size Based on Volume (µm)	Size Based on Surface Area (µm)	Size Based on Number (µm)
1	2.867	2.770	2.591
2	3.319	3.010	2.550
3	4.273	3.488	2.486
Ave.	3.486	3.089	2.542
S.D.	0.718	0.366	0.053

The LS 13 320 Laser Diffraction Particle Size Analyzer, manufactured by Beckman Coulter, is capable of measuring particles suspended in a liquid medium or in a dry powder form by using specially designed sample modules. The module capable of measuring particles in a liquid medium is the Universal Liquid Module (ULM). The ULM is capable of measuring size of particles from 0.040 µm to 2 mm. A wide range of liquids can be used in the ULM including ethanol, glycerol, mineral oils and jet fuel. The LS 13 320 is designed to be compliant with ISO 13320, the standard pertaining to particle size analysis through laser diffraction.

The data presented here is the size of particles found in tap and bottled water using the LS 13 320. Tables 1 and 2 show the particle size results for the tap and bottled water. Figure 1 shows the particle size distributions for the tap and bottled water based on volume, surface area and number percentages. Particle size analysis is useful in applications where knowing the presence of particles is important. Knowing the particle size distribution can be useful in determining contamination or saturation of liquid solutions.

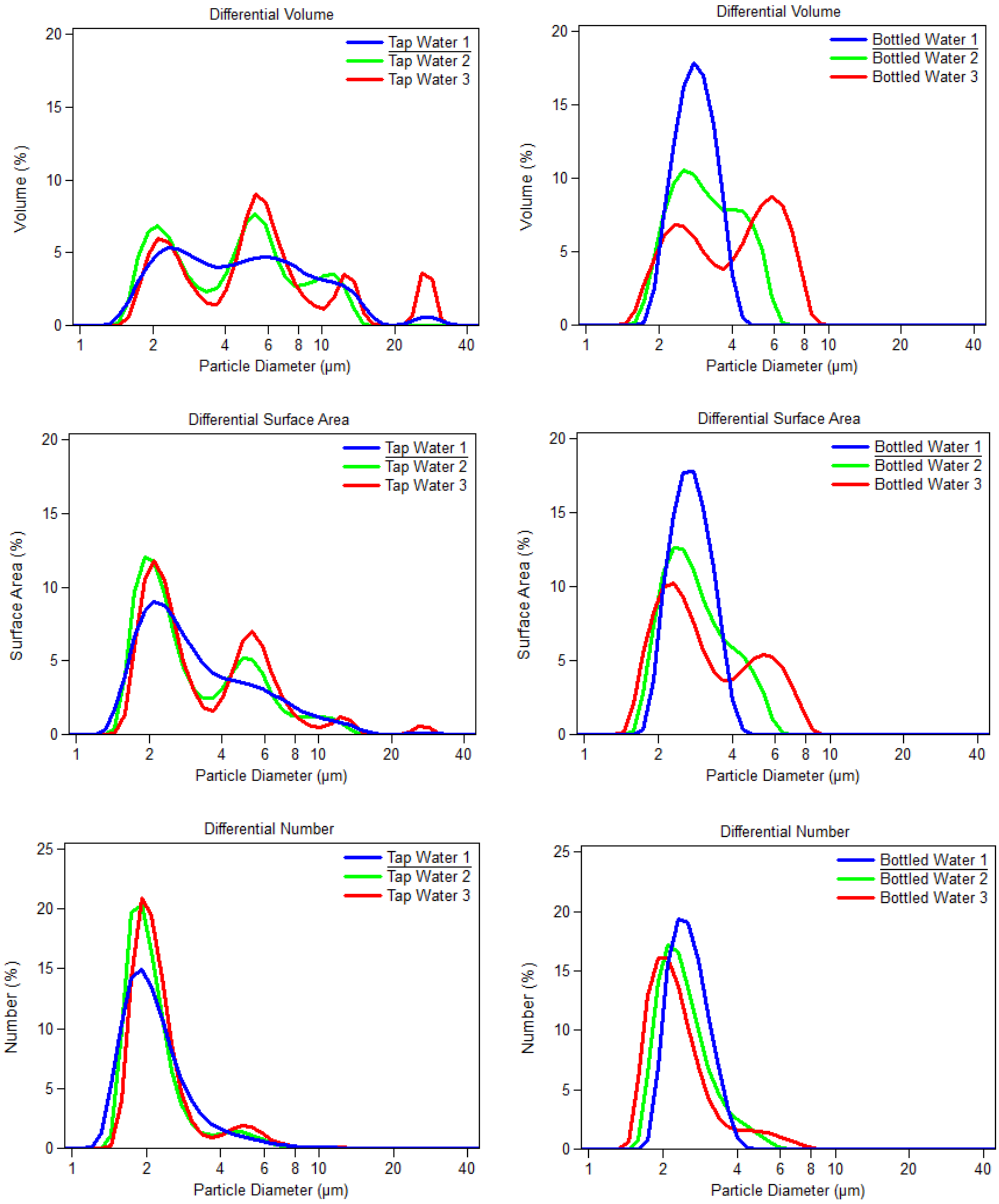

Figure 1. Particle size distributions for the tap and bottled water.