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**A comparative study of laser diffraction vs conventional sedimentation and sieve analyses for particle size measurement using a variety of South African soils.**

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Particle size analyses is considered a fundamental analytical method in most pedologically associated fields of study as well as geotechnical applications. The conventional methods used to determine particle size are time consuming, labour intensive and the sizes measured are limited to a specified number or readings depending on the method used. Laser diffraction as an alternative is a rapid method that analyses particle sizes far below clay fraction in as little as a minute at an accuracy that cannot be achieved by conventional methods.

For this study two methods were used based on standard particle sizing procedures which were then compared. The first method used is the standard sieve and sedimentation method as described in [1][2]. The second method used laser diffraction using a Mastersizer 2000 with a HydroSM attachment [3]. For both methods samples were dispersed using only a 40g/dm<sup>3</sup> sodium hexametaphosphate solution.

Laser diffraction tends to overestimate larger particles (>100µm) and as a result under estimate smaller particles. Sedimentation tends to overestimate fine particles as the settling effect deviates from the calculated settling rates based on particle charge and surface interaction with instruments as well as particle shape effects. Laser diffraction increases data density as well as repeatability allowing sample statistics to calculate reliability of results which is usually not indicated in conventional analyses.

Both methods have limitations which skew results in some way. Sieve and sedimentation analyses are extremely time consuming and labour intensive whilst laser diffraction is rapid and result allow sampling statistics to be incorporated as a standard. Time and labour saved as well as the accuracy of the method at particle sizes significantly smaller than clay particles makes the method an attractive alternative.

*References*

[1] ASTM D421-85(2007), Standard Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants, ASTM International, West Conshohocken, PA, 2007, [www.astm.org](http://www.astm.org)

[2] ASTM D422-63(2007)e2, Standard Test Method for Particle-Size Analysis of Soils, ASTM International, West Conshohocken, PA, 2007, [www.astm.org](http://www.astm.org)

[3] ISO 13320(1999), Particle size analysis – laser diffraction methods – part 1. International Organisation for Standardization, Geneva, Switzerland.

