



# NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

Faculty of Applied Sciences

Applied Physics Department

## Investigation of particle size, Concentration and pH values of some Beverages in Zimbabwe by Laser Light Scattering and Absorption

A thesis submitted in partial fulfillment of the requirements for the award of a Master of Science Degree in Lasers and Optics.

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Laser light absorption and scattering studies using a 0.92mW He-Ne laser and a photodetector for brands of tea and coffee available in Zimbabwe are presented in this project. The thesis is targeted at answering two main objectives. The first one is on studying the scattering profiles due to different brands as a way of determining particle dimensions. Secondly, the project is tasked to study the absorption profiles and then draw some calibration models that can be used to determine the concentration and pH values of the tea and coffee brands.

Particle sizes of the brands are analysed directly when dissolved in distilled water. Particles in the path of the expanded Laser beam scatter the light through diffraction. A lens placed beyond the sample allows the observation of the diffraction pattern at infinity in its focal plane. Information on the dimensions of the particles is estimated from the scattering intensities at different position along the diffraction pattern, the Airy disk.

Laser light absorption technique coupled with Beer-Lambert law was used to draw some calibration models for use in determining concentration and pH values of the brands. The optical method for pH measurement has several outstanding advantages and is preferred in a variety of situations.

In this study tea and coffee brands whose particle dimensions ranging from 4.54 $\mu\text{m}$  to 9.65 $\mu\text{m}$  were determined. It was also found that most of the teas and coffees locally prepared had pH values in the range between 4 to 6. The study considers all the necessary steps to ensure good food quality control. Each step is necessary and important in determining the quality of the food.