

Abstract

In this thesis, an acoustic levitation system was built, evaluated and used in conjunction with the Laser-Induced Breakdown Spectroscopy (LIBS) technique to determine the chemical composition of different liquid samples and dust, to demonstrate its potential for a wide range of applications, such as material characterization and environmental monitoring.

An overview of the current state of the field, the objects of study, the importance of chemical composition analysis, and questions that the project aims to address are presented. The current state of the field is composed of a brief background review of existing literature on LIBS in liquids and sampling approaches, as well as literature that exhibits the potential of the combination of LIBS with acoustic levitation to be beneficial for the analysis of liquids.

This thesis also presents the experimental setup and procedures, including a description acoustic levitation and its development, the type of acoustic levitator used, the parameters of the sound field, as well as the LIBS instrumentation, the sample deposition system, additional instrumentation, and the data analysis methods. Following the presentation and discussion of several applications of the proposed methodology, this work also evaluates its strengths and limitations, shedding light on both its advantages and potential drawbacks in practical applications.