Department of Electrical and Computer Engineering
North South University

Senior Design Project

Light Induced Pulling Force on Canopy Shaped Silver Particles

MUSHFIRAH MORTUZA **ID# 1921850043**

FAHMIDA AKTER **ID# 1921083043**

MITHILA SIDDIQUE **ID# 1921106643**

Faculty Advisor:

Dr. Mahdy Rahman Chowdhury

Assistant Professor

ECE Department

Spring, 2023

LETTER OF TRANSMITTAL

July, 2023

To

Dr. Rajesh Palit
Chairman,
Department of Electrical and Computer Engineering
North South University, Dhaka

Subject: **Submission of Capstone Project Report on "Light Induced Pulling Force on Canopy Shaped Silver Particles"**

Dear Sir,

With due respect, we would like to submit our **Capstone Project Report** on **"Light Induced Pulling Force on Canopy Shaped Silver Particles"** as a part of our BSc program. The report deals with a particular unique shape for optical pulling force. This project was highly beneficial to us because it provided us with new knowledge about the optics sector as well as a new avenue for future research. We did our best to meet all of the specifications specified in this report.

We will be highly obliged if you kindly receive this report and provide your valuable judgment. It would be our immense pleasure if you find this report useful and informative to have an apparent perspective on the issue.

Sincerely Yours,

.....

Mushfirah Mortuza
ECE Department
North South University, Bangladesh

.....

Fahmida Akter
ECE Department
North South University, Bangladesh

.....

Mithila Siddique
ECE Department
North South University, Bangladesh

APPROVAL

Mushfirah Mortuza (ID # 1921850043), Fahmida Akter (ID # 1921083043) and Mithila Siddique (ID # 1921106643) from Electrical and Computer Engineering Department of North South University, have worked on the Senior Design Project titled "Light Induced Pulling Force on Canopy Shaped Silver Particles" under the supervision of Dr. Mahdy Rahman Chowdhury fulfillment of the requirement for the degree of Bachelors of Science in Engineering and has been accepted as satisfactory.

Supervisor's Signature

…….

Dr. Mahdy Rahman Chowdhury

Assistant Professor

Department of Electrical and Computer Engineering

North South University

Dhaka, Bangladesh.

Chairman's Signature

…….

Dr. Rajesh Palit

Professor

Department of Electrical and Computer Engineering

North South University

Dhaka, Bangladesh.

DECLARATION

This is to state that this is our original work. No portion of this work has been submitted elsewhere, in part or in whole, for granting any other degree or diploma. All project-related material will be kept confidential and will not be disclosed without the project supervisor's official approval. Previous works relevant to this study have been properly acknowledged and cited. The supervisor's stated plagiarism policy has been followed.

Students' names & Signatures :

_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

1. Mushfirah Mortuza

_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

2. Fahmida Akter

_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

3. Mithila Siddique

ACKNOWLEDGEMENTS

First and foremost, we would want to thank the Almighty for blessing us with the strength to carry out what is required and complete the report accordingly.

We must express our gratitude to Dr. Mahdy Rahman Chowdhury, an honorary department member, for his constant and diligent supervision, advice, insightful recommendations, understanding, and persistent encouragement to complete this research. Also, we are ever thankful to Dr. Mahdy's "NSU Optics Lab," whose resources were able to meet the essential needs of the research. Furthermore, we thank Dr. Mahdy's research assistants for their support, assistance, and encouragement.

ABSTRACT

Light Induced Pulling Force on Canopy Shaped Silver Particles

Optical pulling force research is gaining prominence alongside the widely studied optical pushing force. Researchers are currently focusing on the phenomenon of using light to pull particles, which has resulted in an increase in the number of studies on this subject. We used sunlight to drag a particle toward the sun to experiment with pulling force. In this experiment, we use lossy silver material to simulate a specific shape, such as a boat canopy. When light interacts with this shape, we calculate force using the tensor equation of force and observe that the particle is traveling toward the source. Though we get pulling force when we use lossy material, we notice the opposite when we use lossless material. This work paves the path for further investigations into the possibilities of shape-based pulling forces, opening up new avenues for inquiry and analysis.