Background/Introduction

- White LEDs are much more useful when compared to traditional illumination.
- Uses at least 75% less energy, and lasts 25 times longer, than incandescent lighting.
- Core-Multishell nanowires will be used as phosphors for the white LEDs to improve its efficiency and color rendering.

Methodology

- CS NWs are modeled as cylinders with infinite length and with the incident light perpendicular to its axis.
- To obtain a solution to Maxwell’s equations, a Mie formalism was utilized to calculate the absorption properties of CS NWs.
- A Green’s Function was applied to calculate LDOS (Local Density Of States) and Purcell Factor of the CS NW. The following is Green’s Function for the inhomogeneous Helmholtz Equation:
  \[
  (\nabla^2 + k^2) G(r, r_s) = \delta(r - r_s) \\
  G(r, r_s) = \frac{1}{4\pi} H_0^1(k|r - r_s|)
  \]
- Specific codes were created to calculate such complex equations on the MATLAB programming language.
- New adaptions of these codes are currently being formulated to be added as functions for the existing tool.
- Graphs were formulated to aid with the results of these calculations.

Results

- The emission properties of CS NWs and nanowires were calculated.
- A few codes were implemented as functions on the tool.

Conclusion

In conclusion, users will be able to find out what materials and dimensions they can implement, to give them the greatest emission and absorption efficiency for core-multishell nanowires as phosphors in white LEDs. More functions will be added to the tool once the codes are fully operational so that it can be more affective.

Acknowledgments

I would like to thank the Electrical and Computer Engineering department at Boston University as well as my advisor Professor Chen Yang and mentor Amartya Dutta. I would also like to thank the nanoHUB technical support team and NCN for helping me in my endeavors.

References