

Master 2017

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UV LED Module for Water Disinfection.

ABSTRACT - Masterthesis

This thesis studies the development process of an UV LED module used in the application of water disinfection. Germicidal ultraviolet UV-C radiation at 265 nm matches the absorption spectrum of DNA of the photosensitive microorganisms and hence can be a major contributor in the sterilization and disinfection of air, water or surface treatment.

Within the scope of work, market research is done on the current available LED modules based on applications in UV-B and UV-C spectrum. Further research is done on the development of the complete package for UV-C radiation emitting module. Based on initial concepts design parameters and requirements are defined. Material investigation is done subsequently of ceramic and glass types. Package design is reviewed with respect to protection of the device and drawings are finalized. Thermal simulations have been conducted to verify the package behavior under thermal stress with different material combinations. Optical simulations are conducted of the glass cap to have a preview of the effective outcome of the design with the software tool Zemax Optic Studio 15.5. Subsequent alternative designs are suggested to increase the performance of the optical cap. Optical Cap fabrication techniques are investigated. In-house fabrication processes are tried out to produce optical caps from different glass materials with and without metallization applied on the glass substrate. Ceramic substrates and blue chips are procured from other sources and a prototype package is built corresponding to two final designs. Optical and thermal characterization of the LED modules is done finally.