Press Release

Helsinki, 2 March 2021 **- Comptek Solutions and Aalto University's Engineered Nanosystems group launch the SuperDevice project to study the effects of controlled oxidation on defected surfaces in optical cooling devices.**

Electroluminescent cooling (ELC) is an effect that appears when efficient light emission from an electrically injected light emitting diode (LED) leads to its cooling. The effect has been known for decades, but its demonstration at practical operating powers has been challenging. Researchers at the Aalto university are partnering with Finnish semiconductor producers Comptek Solutions to try to overcome these challenges.

Studies by **Jani Oksanen**'s research group in Aalto University have suggested that the electronic properties of the material can affect how effective it is at cooling. 'Surface recombination at the mesa edges is an important bottleneck for observing the effect at small and intermediate current densities,' said Dr Oksanen, 'it also plays a major role in enabling optical coolers to operate at high powers while maintaining extremely high efficiency. To design ELC devices for real-world uses, we would need a material with minimal surface recombination.'

Kontrox™ is an atomic level surface engineering technology developed by Comptek Solutions. It produces good quality, high symmetry, stable oxide structure on the surfaces of semiconductor materials. During the SuperDevice project, the effects of Kontrox will be studied in thermophotonic applications where complete elimination of all device losses is required.

As an industrial partner, Comptek Solutions will provide the facilities and research infrastructure to work on GaAs based optical cooler prototypes investigated at Aalto University.

Project SuperDevice aims to demonstrate the feasibility of Kontrox in enabling the hard-to-reach effect of ELC. This will have significant impact on global industry, and on allowing the design of new prototype structures utilizing the paradigm shift enabled by the near-zero surface recombination.

The project enables a mutually beneficial case study of using controlled oxidation in state-of-the-art compound semiconductor devices, potentially overcoming the limitations slowing down the development of optical cooling technologies that may later revolutionize solid state and general cooling applications.

Aalto University's Department of Neuroscience and Biomedical Engineering (NBE) hosting the Engineered nanosystems group *was formed January 1, 2015. It combines the former Department of Biomedical Engineering and Computational Science and the Brain Research Unit of the O.V. Lounasmaa Laboratory.*

NBE's research of micro- and nano electronic materials, photonics and devices roots in the theoretical and computation science background of ENS, and primarily targets breakthroughs in renewable energy technologies and thermophotonic applications.

https://www.aalto.fi/en/department-of-neuroscience-and-biomedical-engineering

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***Comptek Solutions** is a forerunner in III-V compound semiconductor quantum surface engineering. Our innovative Kontrox™ technology delivers up to 98 % reduction of interface defect state density compared to existing methods, which results in an unprecedented boost of efficiency and significant increase in manufacturing yield of devices. Comptek Solutions currently holds 2 registered patent families with three more under review.*

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