

SUCCESS STORY

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Excimer Laser Lift-Off of μLEDs Enables Optical Cochlear Implant

The Challenge

About 700,000 electrical cochlear implants (eCI) have been used worldwide to restore some hearing function for the hearing impaired or deaf. But their limited sound resolution prevents recipients from understanding speech in noisy environments or from enjoying music. One possible solution is to use optogenetics to make the neurons of the ear sensitive to light. Then an optical cochlear implant (oCI) can selectively stimulate different regions of the cochlea with light, according to the frequency of the sound. The goal is to deliver significantly improved quality of life with 32, 64 or even 128 different frequency channels. Speech could then be better understood and music could be enjoyed more than currently possible.

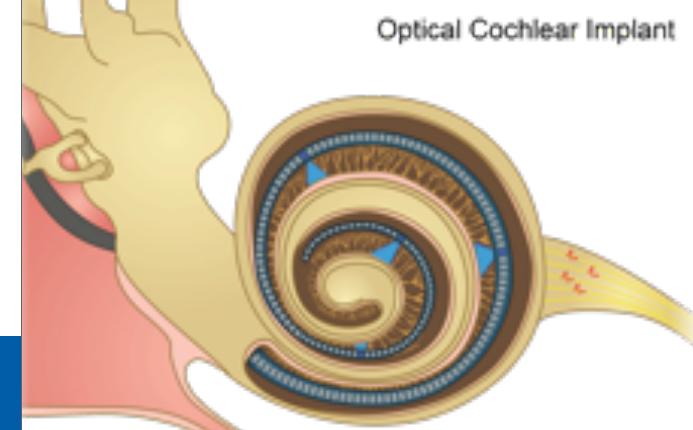
OptoGenTech GmbH is a company at the forefront of this research and development effort, drawing on research at four different German universities as well as seed money from the Photonik Inkubator GmbH, Göttingen. Founder and CTO Dr. Christian Goßler explains, "We reasoned that the best device for oCI development would be a thin flexible device containing numerous highly integrated thin-film μLEDs. A key hurdle was how to remove the LEDs from the sapphire growth wafer and accurately place them on the flexible oCI without any damage whatsoever."

The Solution

Dr. Goßler and colleagues at the University of Freiburg developed an all wafer level fabrication scheme using GaN μLEDs and based around a laser lift-off (LLO) process using a Coherent COMPex excimer laser at 248 nm. LLO is a proven general methodology where ultraviolet laser pulses are applied through the transparent sapphire. These pulses ablate a ten of nanometers thin layer of GaN at the material interface, releasing the GaN from the sapphire. Gossler explains that the high pulse energy of the COMPex enables multiple μLEDs to be gently released with a single laser pulse, and the high to pulse energy stability - better than 0.75% (1 Sigma) – maximizes the process window for this critical fabrication step.

The Result

OptoGenTech are making excellent progress developing their unique oCI technology having developed and successfully tested pre-clinical prototypes. As they move forward towards clinical trials, they are very optimistic that they have a winning solution to significantly improve the quality of life for the hearing impaired. To hear what music will sound like with this new device, listen to this impressive simulation on the company's website.



"The COMPex excimer laser delivers the high pulse energy, pulse-to-pulse stability, and beam uniformity that enables LLO process and helps us make a positive impact on the quality of life for the hearing impaired."

—Dr. Christian Goßler,
OptoGen Tech GmbH,
Goettingen, Germany