Recent Progress and Possible Trends in Infrared Technologies

Johannes Kunsch
Laser Components Gmbh, Germany

The 1st and 2nd Global Talks on infrared topics were held on December 1-2, 2020, and January 19-20, 2021, as live online event. There were two sessions per day at one hour each with a total of 49 speakers and chairs from 14 countries. No sessions ran in parallel. More than 800 attendees from 35 countries followed the live event which can be streamed as well. The event brought together researchers, industry and end users and tries to approach infrared technology as a whole. Therefore, a rough estimate on progress and possible trends becomes possible by using our database of six previous IR WORKshops for comparison.

The QC laser-based non-invasive glucose monitor was a major contribution to the program. Spectroscopic basics, the schedule for ramping up to a smartphone-size device as well as competitive end-user pricing were presented. [3,4] Also, the following question to the community was raised: A small blood count based on FTIR is possible and the knowledge has been there for a while. So, why is there no instrument available?

The development of the Cr:ZnS fs laser is a major step towards the generation of mid-infrared ultrashort pulses with high power and low noise. This laser yields infrared power comparable to a synchrotron, but with extremely low noise. [5] At the end, broadband measurements over up to 10 decades become possible in combination with phase-resolved spectroscopy. [6] The advantages of phase-resolved spectroscopy, like stable base line, have been emphasized in another paper as well. Here, an external cavity QC laser was used as tunable light source. [7] It has been discussed in earlier events already, that the mid infrared suffers from bad knowledge of material parameters like the complex part of the refractive index preventing precise simulation. Those new technologies should be a great help in closing this gap.

A technological breakthrough was presented with a 768x512 pixels near infrared camera with 5 µm pitch. This camera targets to bring the price down since it is designed for a wafer-level process. [8] It uses a thin-film photodetector with PbS quantum dots that peak at 1.45 µm. Speaking on lead salt detectors, new light was shed on the basic function of polycrystalline PbSe photodetectors that have been out in the world for decades and still do outperform modern bandgap-engineered detectors in certain aspects. Modern investigations suggest a mostly uniform current across grains and connecting tissues and a PbI2/PbSe isotype heterojunction based on hole transport. [9]

Miniaturization by MEMS has been an infrared trend for a long time already. Here are 4 recent examples: At first, an MOEMS-based external cavity QC for real-time spectroscopy was presented [10]. Secondly, an on-chip polymer waveguide with 10 x 25 mm size was presented in order to replace bulky multipass cells. [11] Thirdly, the first palm-sized mid infrared FTIR platform was presented at the end of a tutorial on FTIR basics. [12] Last but not least, the specimen to be investigated and the infrared detector have been married into nanostrings and nanotrampolines covered with micelles. The readout signal

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