High Performance Graphene-based IR Photodetectors

Dr Chris Bower

Mark Allen, Alexander A. Bessonov, Piers Andrew, Joseph Bottomley, Alan Colli, Yinglin Liu, Sami Kallioinen, Surama Malik, Ivonne Medina-Salazar, Ashley Rushton, Tapani Ryhanen, Martti Voutilainen

Emberion Oy. Metsänneidonkuja 8, 02130 Espoo, Finland & Emberion Limited, 151, Science Park, Cambridge, CB4 0GN, UK
www.emberion.com
chris.bower@emberion.com

Emberion, SME operating in Finland and UK, has built a graphene-based imaging solution for high-performance cameras used in night-time imaging and industrial applications. Our graphene-based detectors are suitable for superior quality imaging in visible (VIS) to short-wave infrared (SWIR) and MWIR wavelengths. This wavelength range offers unique opportunity to significantly improve the performance of cameras used in surveillance, industrial quality control and machine vision applications. This potential is widely recognized in the industries, yet rarely used in practise due to lack of affordable solutions. Our unique value proposition is the result of complex R&D efforts in the field of graphene, nanomaterials and electronics integration, using a combination of nanocrystalline vis-SWIR absorbers [1] and pyroelectric absorbers [2] for MWIR it will be possible to create integrated broadband hyperspectral imagers. Emberion's cost and performance advantages come from combining our patented nanomaterial innovations with our tailored CMOS readout electronics.

References

[1] Alexander A. Bessonov, Mark Allen, Yinglin Liu, Surama Malik, Joseph Bottomley, Ashley Rushton, Ivonne Medina-Salazar, Martti Voutilainen, Sami Kallioinen, Alan Colli, Chris Bower, Piers Andrew, and Tapani Ryhänen. May 30, (2017) ACS Nano: doi: 10.1021/acsnano.7b00760 "Compound Quantum Dot–Perovskite Optical Absorbers on Graphene Enhancing Short-Wave Infrared Photodetection"

[2] U. Sassi, R. Parret, S. Nanot, M. Bruna, S. Borini, S. Milana, D. De Fazio, Z. Zhuang, E. Lidorikis, F. H. L. Koppens, A. C. Ferrari, A. Colli. Nature Communications 8, 14311 (2017) doi:10.1038/ncomms14311 "Graphene-based, mid-infrared, room-temperature pyroelectric bolometers with ultrahigh temperature coefficient of resistance."

[3] https://www.laserfocusworld.com/articles/print/volume-54/issue-02/newsbreaks/nanotechnology-based-vis-swir-detectors-challenge-limits-of-ingaas-designs.html

[4] https://www.electrooptics.com/news/analysis-opinion/graphene-cmos-integration-show-photonics-west

Figures

Figure 1: *Emberion's single pixel photodetector device (1), photodetector module (2) and the evaluation kit for customer demonstrations (3)*

Figure 2: Emberion's pilot fabrication line