Invited Paper

Nanocolours: Correlating Structure with Function

Ille C. Gebeshuber*

Institute of Microengineering and Nanoelectronics, Universiti Kebangsaan Malaysia, Malaysia.
*Email:ille.gebeshuber@mac.com

Structural colours refer to colours generated by nanostructures, with the characteristic dimension of the structures on the wavelength of the visible light (i.e., some hundreds of nanometers). Structural colouration occurs e.g., in CDs and DVDs, in soap bubbles or oil films on water, in butterfly wings [1] and in the wings of the carpenter bee [2].

The physical fundamentals of structural colours comprise thin-film interference, multilayer interference, diffraction of light and diffraction gratings, photonic crystals and light scattering. No chemical dyes or pigments need to be involved in the generation of the colours – it is all in the structure!

Structural colours do not bleach. They can be functionalized and applied as sensors, e.g. in security, engineering and medicine. Correlation of elaborate natural nanostructures with their optical function inspires novel approaches in man-made structural colours, via biomimetics (i.e., knowledge transfer from biology to technology) [3,4].

References

[1] Matin T.R., Menon P.S., Shaari S. and Gebeshuber I.C. (2009), "Photonic crystal micro- and nanostructures in iridescent butterfly wings", *Proc. Nanotech Malaysia 2009 Conference, KLCC, Kuala Lumpur Convention Centre, Malaysia,* October 27-29, 2009, p. 170-171, ISBN: 9789834 492106.

[2] Gebeshuber I.C., Matin T.R., Menon P.S., Shaari S., Leong M.K. and Majlis B.Y. (2010), "Correlating nanostructures with function: Structural colours in wings of the Malaysian carpenter bee," *3rd Nanoscience & Nanotechnology Symposium*, June 16, 2010, Bandung, Indonesia, Keynote Presentation.

[3] Gebeshuber, I.C., Gruber, P. and Drack, M. (2009) "A gaze into the crystal ball – biomimetics in the year 2059," *Proceedings of the Institution of Mechanical Engineers Part C: Journal of Mechanical Engineering Science,* vol. 223, No. 12, pp. 2899–2918.

[4] Gebeshuber, I.C. Stachelberger H., Ganji B.A., Fu D.C., Yunas J. and Majlis B.Y. et al. (2009), "Exploring the innovational potential of biomimetics for novel 3D MEMS," *Advanced Materials Research*, vol. 74, pp. 265–268.

978-1-4244-8854-4/10/$26.00 ©2010 IEEE