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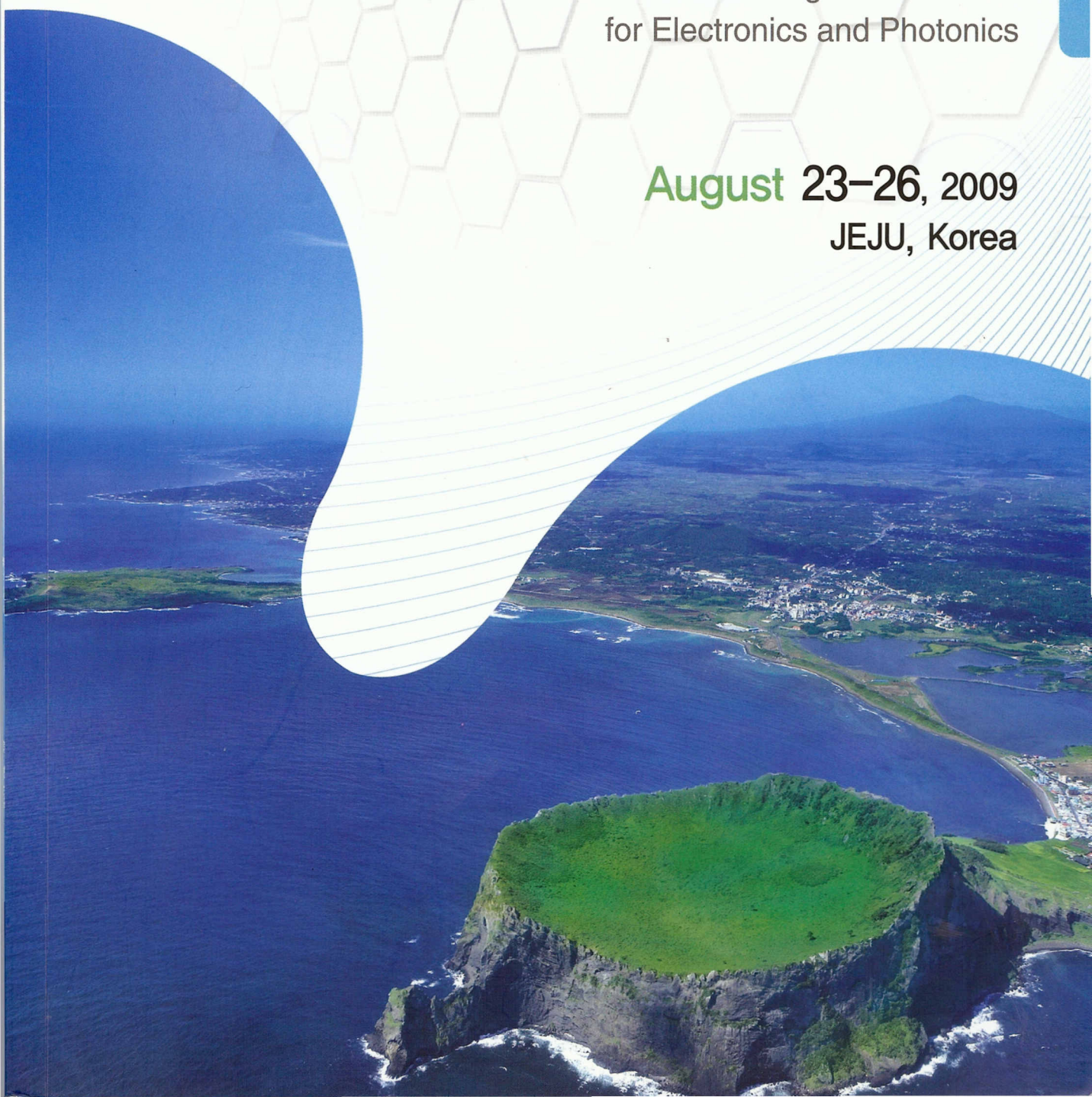

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Optical and bio applications using organic-based nanostructures

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Organic nanostructures of light emitting polymers and small molecules were fabricated. The photoluminescence (PL) characteristics of the nanostructures in nanoscale were measured through laser confocal microscope (LCM) with a high spatial resolution. We found that PL efficiency of light-emitting polymer nanotubes (NTs) or nanoparticles (NPs) dramatically increased through the nanoscale metal coating (or vice versa) or attaching metal NPs [1,2]. We analyze the results of the enhancement of PL efficiency based on an energy and/or charge transfer effect in a surface plasmon resonance coupling and a local electric field enhancement between metal NPs. For optical applications of the hybrid nanostructures using light-emitting polymer, we fabricated light-emitting and flexible color bar-code nanowires (NWs) through electrochemical synthesis of polymers′ compartments coated with nanoscale metal. The nanoscale optical characteristics and environmental stability of the light-emitting bar-code NWs are presented and discussed.

For bio-applications, we studied the direct detection (i.e., label-free) of DNA using a single strand of light-emitting polymer NTs. New concept of the hybridization of probe-DNA with light-emitting polymers is discussed. The dramatic variation of luminescence color and intensity through the attachment of probe-DNA and target-DNAs onto light-emitting polymer NTs was observed through color CCD images and LCM PL spectra. These results have originated from the conformational modification of polymer chains and the fluorescence energy transfer effect from target-DNA to light-emitting polymers.

References

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[2] M. S. Kim, J. Joo, et al., ACS Nano **3**, 1329 (2009).

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