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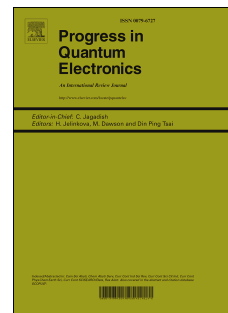
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Nano-scale chemical reactions based on non-uniform optical near-fields and their applications

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Abstract

Interaction between light and materials is essential in the physics underlying all optical devices, including light emitting devices such as light emitting diodes and lasers, photo-voltaic devices, and photo-synthesis systems. The demand for higher light utilization efficiency is becoming increasingly important for advanced optical devices. This is because, when feature size is smaller than the incident light wavelength, photons cannot couple with devices efficiently. In this paper, we review recent progress regarding a unique phenomenon at the nano scale and its applications. First, we summarize the development of light-matter interactions at the nano-scale. Second, we review recent theoretical works focusing on optical near fields in which unique phenomena arise from non-uniform optical fields. We then review several recent developments based on the near-field effect, including artificial photosynthesis and near-field etching for realization of angstrom-scale fattened surfaces. Finally, we discuss the future outlook for these technologies.

Keywords: Non-uniform optical near field, second harmonic generation, photodissociation path with two-step excitation, artificial photosynthesis, near-field etching

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