Presenter

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Abstract

Title: *Excitonic and Plasmonic Strong-coupling in Microcavities*

By confining electromagnetic radiation in microcavities and coupling it to electronic modes of matter, entirely different light-matter interactions can result. Essentially both photonic and electronic wavefunctions can be sculpted on 1-1000nm lengthscales in materials which have been suitably nanostructured. We discuss in this talk two different realisations of such coupling, for excitons in planar semiconductor microcavities, and excitons in plasmonic metal nano-cavities.

Recently there is much interest in semiconductor microcavities because of their strong exciton-photon coupling, which produces new quasiparticles (polaritons) with unusual nonlinear optical properties. The mixed dispersion relations for these polaritons forms a trap in momentum-space which produces the largest optical nonlinearites of any known material [1,2], and stimulated scattering of the bosonic polaritons [3]. Current efforts are devoted to developing novel microcavity devices which work up to room temperature, for which GaN is predicted to be ideal. We recently reported the first polariton laser at room temperature [4].

Metals which are nanostructured provide confinement for plasmons trapped at their surface. We have developed a novel 3D nanovoid geometry which confines plasmon in cavities [6-8]. By combining such nanostructures with oprganic semiconductors, we recently demonstrated strong coupling of exciton-plasmons at room temperature [9]. These example typify the new physics that is possible is active microcavities.

References

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Biography

***DR. BAUMBERG** is Director of NanoScience at the University of Southampton and Professor of both Physics and Electronics. He is an established innovator in NanoPhotonics, and was awarded the 2004 Royal Society Mullard Prize, the 2004 Mott Lectureship of the Institute of Physics as well as the Charles Vernon Boys Medal in 2000. Strong experience at Hitachi, as an IBM Fellow and recently with his $14M spin-off, Mesophotonics, making photonic and plasmonic crystals, inform his research.*