Coupled Surface Polaritons

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In our work we study one dimensional (1D) structures consisting of a dielectric constant back ground material (ε_b) and a polaritonic material. The dielectric function $\varepsilon(\omega)$ is resonant at the transversal frequency ω_T and provides a band gap between ω_T and the longitudinal frequency ω_L.

For parallel propagation on a interface of these two materials one obtains the physics of surface polaritons (SPO) whose dispersion relation is well known in literature. In a thin film the SPO at the top interface couples with the one on the bottom surface and one obtains a symmetric and antisymmetric solution.

If we design a 1D photonic crystal (PC) consisting of periodically layered thin films in a back ground material we obtain a modified dispersion: One can see that the slope of the dispersion for large wavelengths is modified with the filling factor of the PC [1]. Further the bulk mode couples to the surface mode as the bulk mode can not exist in the forbidden frequency region. This yields a negative and even infinite group velocity which is not unphysical and is discussed in detail in our contribution. The expression for the energy velocity is strongly modified due to the dispersive and absorbing dielectric function.

[1] M. Bergmair, M. Huber and K. Hingerl, *APL*, 89, 081907 (2006)