# Light-dressed spectroscopy of confined molecular systems

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Within the context of polaritonic chemistry [1], we investigate theoretically the rovibronic spectrum of a simple molecule, $Na_2$, when it interacts with the radiation mode of a microscopic cavity. The dependence of the spectrum on the light−matter coupling strength in the cavity and on the frequency of the cavity mode is studied in detail [2]. When additional atoms are added to the system, the indirect coupling between atoms and the molecule, realized by their interaction with the cavity radiation mode, leads to a coherent mixing of atomic and molecular states, and at strong enough cavity field strengths hybrid atom-molecule-photon polaritons are formed. It is shown that by changing the cavity wavelength and the atomic transition frequency, the potential energy landscape of the polaritonic states and the corresponding spectrum could be changed significantly [3]. This demonstrates that by adding a second type of entity to a quantum system confined in a microscopic cavity, the dynamics of the system and its response to light can be modified, implying possible new directions in polaritonic chemistry.

**References**

[1] T. W. Ebbesen, Acc. Chem. Res. **49** (2016) 2403.
[2] T. Szidarovszky *et al*., J. Phys. Chem. Lett. **9** (2018) 6215.
[3] T. Szidarovszky, G. J. Halász and Á. Vibók, New J. Phys. submitted.