Towards an optogalvanic trace gas sensor based on Rydberg excitations

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To demonstrate the applicability of a new kind of gas sensor employing state of the art continuous wave lasers and current detection in a trace gas sensor prototype. From an unknown mixture of gas the molecule in question is excited to a Rydberg state and subsequently ionized by collisions with all other gas components. The emerging charges can be measured as a current which is then a clear signature of the presence of this particular molecule.
As a first test we excite Alkali Rydberg atoms in an electrically contacted vapor cell [1,2]. For a real life application we employ our gas sensing scheme to nitric oxide at thermal temperatures and atmospheric pressure [3]. We report three photon continous wave laser excitation of nitric oxide to high lying Rydberg states and its conversion into a detectable current in the nA regime.

References

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