Optical-optical double resonance spectroscopy of CdAr van der Waals dimers produced in pulsed supersonic molecular beam source

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In optical-optical double resonance (OODR) method, two laser beams are used to excite the low-lying Rydberg state via the intermediate electronic state. We have used this method to examine rotational energy structure of different vibrational components of the $E^3\Sigma^+ (6^3S_1) \rightarrow A^3\Pi_{0+} (5^3P_1)$ transition in CdAr van der Waals dimer produced in molecular beam using a high temperature pulsed source [1].

We present how a change of wavelength and spectral bandwidth of the laser beam, which excites the molecule to the intermediate level ($A^3\Pi_{0+} \rightarrow X^1\Sigma^+ (5^1S_0)$) can be used to excite only selected isotopologues to the $E^3\Sigma^+$ state. The presented method leads to simplification of the observed laser induced fluorescence (LIF) excitation spectra (see Fig.1), which significantly facilitates their analysis. Additionally, new ro-vibrational characteristics of the $E^3\Sigma^+$ state of CdAr will be presented.

**Fig. 1. LIF excitation spectrum of the $E^3\Sigma^+ (\nu'=1) \rightarrow A^3\Pi_{0+} (\nu''=5)$ transition in CdAr.**

(a) Experimental spectrum encompassing signals originating from several isotopologues (including $^{116}\text{Cd}^{40}\text{Ar}$, $^{114}\text{Cd}^{40}\text{Ar}$ and $^{112}\text{Cd}^{40}\text{Ar}$). (b) Experimental spectrum encompassing signal for $^{128}\text{Cd}^{40}\text{Ar}$ isotopologue only.

Keywords: CdAr vdW dimer, OODR method, molecular isotopic structure

Acknowledgment

This work was supported by the National Science Centre Poland under grant number UMO-2015/17/B/ST4/04016.

References