Rotational structures in excitation spectra of the $B^3 1(5^3P_1) \leftarrow X^1 0^+(5^1S_0)$ transition in CdAr

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We present resolved rotational structures in a number of $v' \leftarrow v''=0$ vibrational components in excitation spectra first-time recorded using the $B^3 1 \leftarrow X^1 0^+$ transition in CdAr van der Waals complex (see Fig. 1).

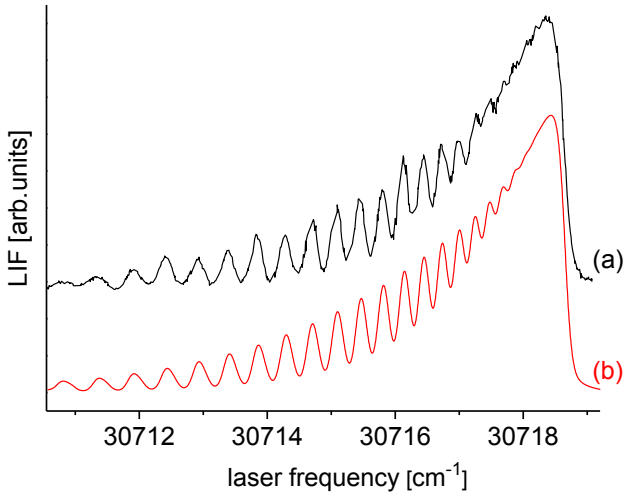

Fig. 1. Rotational profile of the $v'=2 \leftarrow v''=0$ vibrational component recorded in the excitation spectrum using the $B^3 1 \leftarrow X^1 0^+$ transition in CdAr. Comparison between (a) experimental profile recorded for 3.5 bar carrier gas pressure, 0.15 mm diameter of the nozzle orifice and 11 mm distance to the excitation point in the beam, and (b) simulation performed for 5.3K rotational temperature, 0.07 cm^{-1} Lorentz and 0.15 cm^{-1} Gauss convolutions (FWHM) corresponding to the laser beam spectral bandwidth and Doppler broadening, respectively. Effective rotational constants $B_{v'=2}=0.019940$ cm^{-1} and $B_{v''=0}=0.030034$ cm^{-1} were determined for most abundant $^{114}Cd^{40}Ar$ isotopologue.

The spectra were recorded using new high-temperature high-pressure all-metal supersonic pulsed beam source [1] which was designed and constructed as a part of apparatus for realization of Bohm's spin-1/2 particle version of the Einstein-Podolsky-Rosen (E-P-R) experiment for entangled ^{111}Cd atoms [2,3].

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References:

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