

Separation of overlapped profiles originated from different complexes excited in a supersonic expansion beam experiment

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A method of separation of overlapped spectra originating from different laser-excited complexes in a supersonic expansion beam will be presented. The method, which general idea is illustrated in Fig. 1, is used to analyze data recorded in the experiment using a high temperature pulsed supersonic beam of diatomic complexes containing cadmium i.e., Cd₂ and CdRg, where Rg=rare gas [1],[2]. The method is based on the observation that lifetimes of different complexes in their excited electronic states differ. Therefore, by applying the proper subtraction of spectra obtained for different time-gating windows, one can obtain the spectrum in which admixture from unwanted molecule is considerably reduced (for the time-gating window detection see [1]). As an example, the separation of overlapped profiles recorded using the $B^31 \leftarrow X^10^+$ and $b^30_u^+ \leftarrow X^10_g^+$ transitions in CdAr and Cd₂, respectively [3] will be presented.

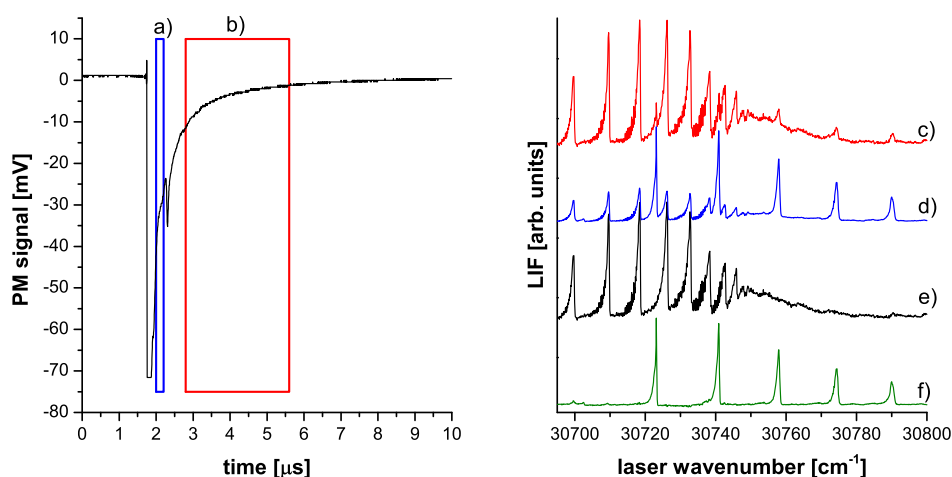


Figure 1: Illustration of the spectra separation method using an example of overlapped Cd₂ and CdAr excitation spectra. a) Blue (narrow) time-gating window employed in the detection of Cd₂ using the $b^30_u^+ \leftarrow X^10_g^+$ transition with an unwanted admixture of CdAr; b) red (wide) time-gating window employed in detection of CdAr excitation spectrum using the $B^31 \leftarrow X^10^+$ transition with an admixture of Cd₂; c) excitation spectrum corresponding to the red (wide) time-gating window; d) excitation spectrum corresponding to the blue (narrow) time-gating window; e) result of subtraction of spectra presented in (c) and (d): resulting CdAr spectrum contains only small admixture of Cd₂; f) as in (e) but showing restoration of the Cd₂ spectrum.

Presented studies are supported by the National Science Centre Poland according to contract no.

UMO-2011/01/B/ST2/00495.

References

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