TABLE I. Computed differences of interaction constants for upper and lower states of a potential function of Lennard-Jones type and other parameters from the observed half-width and shift at low pressures.

Colliding pairs	Ca 4227/Ar	Ca 4227/He
$\Delta\nu_m$	-0.23 cm^{-1}/rd	-0.019 cm^{-1}/rd
$\Delta\nu_{1/2}$	0.67 cm^{-1}/rd	0.64 cm^{-1}/rd
T	556 °C	571 °C
ΔC_6	8.72×10^{-31} cm^6/sec or 9.2×10^{-58} erg cm^6	8.38×10^{-32} cm^6/sec or 9.2×10^{-59} erg cm^6
ΔC_{12}	7.22×10^{-73} cm^{12}/sec or 7.6×10^{-100} erg cm^{12}	1.04×10^{-74} cm^{12}/sec or 1.09×10^{-99} erg cm^{12}
σ_r	2.51×10^{-14} cm^2	1.01×10^{-14} cm^2
ρ	8.94 Å	5.68 Å
r_{pm}	10.9 Å	7.93 Å
$\Delta\nu_s$	-1.40 cm^{-1}	-0.89 cm^{-1}
I_s/I_l	0.04	0.016

$$I(\Delta\omega)=\frac{2e^2\omega^4|x_0|^2}{3\pi c^3}\,\frac{nv\delta_r}{(\Delta\omega-nv\delta_i)^2+(nv\delta_r)^2},$$

where the half-width $\Delta\omega_{1/2}$ and shift $\Delta\omega_m$ are related to the real and imaginary part of the Weisskopf collision cross section as

$$\Delta\omega_{1/2}=2nv\delta_r=4\pi nv\int_0^\infty \rho\,d\rho\,[2\sin^2(\tfrac{1}{2}\theta)],$$

$$\Delta\omega_m=nv\delta_i=2\pi nv\int_0^\infty \rho\,d\rho\,\sin\theta,$$

where v is the relative velocity of collision, n the number density of perturbers, ρ the collision distance, and θ the phase change

$$\theta=\int_{-\infty}^{\infty}\Delta\omega(t)\,dt.$$

$\Delta\omega$ may be expressed with two parameters, such as those in the Lennard-Jones form

$$\Delta\omega(t)=\left(\frac{\Delta C_{12}}{\gamma^{12}}-\frac{\Delta C_6}{\gamma^6}\right),$$

where $\gamma=[\rho^2+(vt+\epsilon)^2]^{1/2}$, ρ is the impact parameter, assuming a straight perturber path relative to the absorber, and the ΔC's are the differences-of-interaction constants for upper and lower states. Consequently, one can put $\Delta\omega_{1/2}$ and $\Delta\omega_m$ as functions of ΔC_{12} and ΔC_6, and the latter can be computed.[13] The results of computations are shown in Table I, where $\Delta\nu_m$ is the shift in cm^{-1}; $\Delta\nu_{1/2}$ is the half-width; T is the temperature of the absorption column; σ_r is the real part of the Weisskopf collision cross section; ρ is the optical collision diameter; r_{pm} is the interatomic distance at which the differences of potentials of upper and lower states have a minimum value; $\Delta\nu_s$ is the position of the satellite with respect to the line peak if the satellite position is related to the minimum of the differences of potentials; and I_s/I_l the estimated intensity of the "red" satellites with respect to that of the line peak under 1 rd of Ar or He from the probability density. Actually, the shapes of potential curves for the two states may be rather different, so that there is no simple connection between satellite position and potential minimum. These values will be revised as soon as the work mentioned in the first paragraph of this section becomes successful.

The ΔC_6 of Hindmarsh's[2] result for Ca 4227/He was $3\pm1\ 10^{-59}$ erg cm^6. Our value is about three times higher because we report a small red shift instead of blue shift and the broadening was measured under higher rd where the half-width per rd could be increased by the overlapping satellite.

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