

Abstract Submitted
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Pump/Probe measurement of V-V transfer in O₂ and H₂ TAI
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Ohio State University — We present new sets of V-V rate coefficients for vibrational
levels 0 – 5 in O₂ and H₂ at 300 K, using a stimulated Raman – spontaneous Raman
pump/probe apparatus. For O₂ it is found that previously reported semi-classical
trajectory calculations of Coleti and Billing underestimate the V-V rate coefficients
by approximately one order of magnitude, in agreement with recent measurements by
of Kalogerakis and the earlier observations of Diskin. For H₂ non-resonant processes,
comparison with recalculated semi-classical predictions using the identical potential
to that given by Cacciatori and Billing results in predicted rates which are too
fast, by a factor of ~ 2.5 , consistent with the previously reported value of Kreutz.
However for the “resonant” V-V process, H₂ (v=1) + H₂ (v=1) \rightarrow H₂ (v=2) +
H₂ (v=0), predictions are found to be too slow, by a factor of approximately two,
consistent with previous reported data of Farrow and Chandler. This suggests that
semi-classical calculation methods that treat the rotational motion classically may
be unsuitable for H₂, due to rotational energy level spacings which are comparable
to $k_B T$.

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