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Strong Quantum Level Dependence of Na_2 ($4^1\Sigma_g^+$) Lifetimes. NADEEPA JAYASUNDARA, LUTZ HUWEL, Wesleyan Univ, SETH ASHMAN, EMMA BURGESS, Providence College — Radiative lifetimes of Na_2 ro-vibrational levels of the $4\Sigma_g^+$ shelf state have been calculated in a continuation of our previous work [R. Anunciado *et al.*, J. Chem. Phys. **145**, 174306 (2016)] to investigate the importance of bound-free transitions for radiative lifetimes. The lifetime calculations are performed for selected vibrational levels from 0 to 75 and rotational levels, J=1, 20, 40, 60, and 80 and for rotational levels from 0 to 90 in vibrational levels v = 49, 50 and 51. We find that radiative lifetimes vary significantly with vibrational level, particularly around the shelf. In addition, we observe a strong, unusual, oscillatory radiative lifetime dependence on rotational quantum number. Another aspect we want to emphasize is the significance of including the bound-free transitions into the calculation which reduces the lifetime noticeably compared to the results of recent work that did not include this channel [A. Sanli *et al.*, J. Chem. Phys. **143**, 104304 (2015)]. The lifetimes of individual ro-vibrational levels of the $4^1\Sigma_g^+$ shelf state were calculated using the LEVEL 8.2 and BCONT programs by Robert Le Roy, the latter in a version modified by Brett McGeehan.

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