The vibronic spectrum of allyl radical (CH$_2$CHCH$_2$) at 4.9-8.2 eV has been observed using 1+1 and 2+1 resonance-enhanced multiphoton ionization (REMPI) spectroscopy. The allyl radicals were produced in the nozzle of a supersonic jet expansion by the pyrolysis of allyl iodide. The vibronic assignment for the congested B$_1$$^1$A$_1$($\pi \rightarrow 3s$), C$_2$$^2$B$_2$($\pi \rightarrow 3px$) and D$_1$$^1$B$_2$($\pi \rightarrow n^*$) bands at 4.9-5.2 eV will be reexamined with aid of the calculated Franck-Condon factors, especially for the weaker transitions at >5.2 eV which were not identified in previous study.$^a$ Three new electronic bands are observed for the first time and assigned to the $^3$B$_1$($\pi \rightarrow 3dx_z$), $^2$A$_2$($\pi \rightarrow 3dx_y$) and $^3$A$_1$($\pi \rightarrow 3pz$) Rydberg states based on the ab initio CI calculation.$^b$ The observed band origins (in eV) at 6.460 ($^3$B$_1$), 6.607 ($^2$A$_2$) and 7.605 ($^3$A$_1$) are compared with the calculated vertical energies of 6.41, 6.62 and 7.55, respectively. Vibrational progressions with the gross spacings of $\sim$420 cm$^{-1}$ are observed in the Rydberg states. The totally symmetric CCC bending in the excited state is responsible for the observed progression as that reported in the B state.$^c$

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