TABLE E.1 (*Continued*)

<table>
<tr><th>Quadrupole</th><th>Pairing</th></tr>
<tr><td colspan="2">States of higher energy correspond to</td></tr>
<tr><td>$\beta$ and $\gamma$ vibrations.<br>$B(E2)$ values</td><td>pairing vibrations.<br>Two-particle transfer reactions</td></tr>
<tr><td colspan="2">among members of the ground state</td></tr>
<tr><td>rotational</td><td>superfluid</td></tr>
<tr><td colspan="2">band are proportional to the square of the intrinsic static</td></tr>
<tr><td>quadrupole moment $Q_0$</td><td>pairing gap $\Delta$</td></tr>
<tr><td colspan="2">whereas transitions from the ground state band to an excited band have</td></tr>
<tr><td>$B(E2;\, I_i \to I_f) = |\langle K_f | \mathscr{M}(E2, \nu) | K_i \rangle|^2 \langle I_i K_i 2 K_f - K_i | I_f K_f \rangle^2$</td><td>$\sigma(\text{g.s.} \to \text{p.v.}) \approx |\langle \text{p.v.} | T(\Delta) | \text{g.s.} \rangle|^2$</td></tr>
<tr><td colspan="2">Typical values for strongly distorted nuclei are</td></tr>
<tr><td>$B(E2;\, 2^+ \to 0^+) \approx 100\, B_{sp}$<br>$B(E2;\, 2'^+ \to 0^+) \approx 3\, B_{sp}$</td><td>$\sigma(\text{g.s.}(A) \to \text{g.s.}(A+2)) \approx 50\, \sigma_{sp}$<br>$\sigma(\text{g.s.}(A) \to \text{p.v.}(A+2)) \approx 1\, \sigma_{sp}$</td></tr>
<tr><td colspan="2">For small values of</td></tr>
<tr><td>$\chi$</td><td>$G$</td></tr>
<tr><td colspan="2">the system has</td></tr>
<tr><td>$Q_0 = 0$</td><td>$\Delta = 0$</td></tr>
<tr><td colspan="2">and the system displays a typical phonon spectrum.</td></tr>
<tr><td>Angular momentum</td><td>The number of particles</td></tr>
<tr><td colspan="2">is conserved and each phonon</td></tr>
<tr><td>carries $I^\pi = 2^+$</td><td>has $\alpha = \pm 2$</td></tr>
<tr><td colspan="2">It corresponds to oscillations</td></tr>
<tr><td>of the surface around $Q_0 = 0$.</td><td>of $\Delta$ around $\Delta_{eq} = 0$.</td></tr>
<tr><td colspan="2">The energy is given by</td></tr>
<tr><td>$\mathscr{E}_Q = (n + \frac{5}{2})\, \hbar\omega_q$<br>$n$ = number of quadrupole phonons<br>$\omega_q$ = frequency of the quadrupole mode</td><td>$\mathscr{E}_p = (n + 1)\, \hbar\omega_p$<br>$n$ = number of pairing phonons<br>$\omega_p$ = frequency of the pairing mode</td></tr>
<tr><td colspan="2">The microscopic RPA wave function of a one-phonon state is given by</td></tr>
<tr><td>$|2^+\rangle = \Gamma_{2+}^+ |\tilde{0}\rangle_q$<br>$= \sum_{\omega,\gamma} \left\{ \frac{\langle \omega \| r^2 Y_2 \| \gamma \rangle}{\varepsilon_\omega + \varepsilon_\gamma - \hbar\omega_q} [c_\omega^+ c_\gamma]^2 + \frac{\langle \omega \| r^2 Y_2 \| \gamma \rangle}{\varepsilon_\omega + \varepsilon_\gamma + \hbar\omega_q} [c_\gamma^+ c_\omega]^2 \right\} |\tilde{0}\rangle_q$</td><td>$|1,0\rangle = \Gamma_r^+ |\tilde{0}\rangle_p = \left\{ \sum_\omega \frac{c_\omega^+ c_{\tilde{\omega}}^+}{2\varepsilon_\omega - \hbar\omega_p} + \sum_\gamma \frac{c_\gamma^+ c_{\tilde{\gamma}}^+}{2\varepsilon_\gamma - \hbar\omega_p} \right\} |\tilde{0}\rangle_p$<br>$n_a$ ($n_r$): number of pair addition (removal) quanta.</td></tr>
<tr><td colspan="2">$c_\nu^+$ creates a "Mayer–Jensen" particle.</td></tr>
<tr><td colspan="2">Because of the conservation of</td></tr>
<tr><td>angular momentum</td><td>number of particles</td></tr>
<tr><td colspan="2">at least two-phonons are required to build</td></tr>
<tr><td>a $J^\pi = 0^+$ state<br>$|0'^+\rangle = [\Gamma_{2+}^+ \Gamma_{2+}^+]^0 |\tilde{0}\rangle_q$<br>The electromagnetic transition probabilities<br>$\frac{B(E2;\, 0'^+ \to 2^+)}{B(E2;\, 2^+ \to 0^+)} \approx 1$<br>and $B(E2;\, 2^+ \to 0^+) \approx 20\, B_{sp}$<br>$B(E2;\, 2'^+ \to 0^+) \approx 0$</td><td>an excited state in the nucleus $A_0$<br>$|0'^+\rangle = \Gamma_a^+ \Gamma_r^+ |\tilde{0}\rangle_p$<br>The cross section ratio<br>$\frac{\sigma(\text{g.s.}(A_0 - 2) \to \text{p.v.}(A_0))}{\sigma(\text{g.s.}(A_0 - 2) \to \text{g.s.}(A_0))} \approx 1$<br>and $\sigma(\text{g.s.}(A_0 - 2) \to \text{g.s.}(A_0)) \approx 10\, \sigma_{sp}$<br>$\sigma(\text{g.s.}(A_0) \to 0'(A_0 + 2)) \approx 0$<br>where $A_0$ represents the closed-shell system.</td></tr>
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