

$$\phi(r) = 4\epsilon \left[(\sigma/r)^{12} - (\sigma/r)^6 \right] \quad (1)$$

$$E(r) = \phi(r) - \phi(R_c) - (r - R_c) \left. \frac{d\phi}{dr} \right|_{r=R_c}, \quad r < R_c \quad (2)$$

$$E(r) = 4\epsilon \left\{ \left[(\sigma/r)^{12} - (\sigma/r)^6 \right] + \left[6(\sigma/r_c)^{12} - 3(\sigma/r_c)^6 \right] (r/r_c)^2 - 7(\sigma/r_c)^{12} + 4(\sigma/r_c)^6 \right\} \quad (3)$$