Eliashberg equations

$$Z(\mathbf{k}s, i\omega_n) = 1 + \frac{\pi}{\beta\omega_n N(0)} \sum_{\mathbf{k}'s',n'} \frac{\omega_{n'}\delta(\epsilon_{\mathbf{k}'s'} - \epsilon_F)}{\sqrt{\omega_{n'}^2 + \Delta^2(\mathbf{k}'s', i\omega_{n'})}} \lambda(\mathbf{k}s, \mathbf{k}'s', n - n')$$

$$\begin{aligned} Z(\mathbf{k}s, i\omega_n)\Delta(\mathbf{k}s, i\omega_n) \quad = \quad & \frac{\pi}{N(0)\beta} \sum_{\mathbf{k}'s',n'} \frac{\Delta(\mathbf{k}'s', i\omega_{n'})\delta(\epsilon_{\mathbf{k}'s'} - \epsilon_F)}{\sqrt{\omega_{n'}^2 + \Delta^2(\mathbf{k}'s', i\omega_{n'})}} \\ & [\lambda(\mathbf{k}s, \mathbf{k}'s', n - n') - \mu^*] \end{aligned}$$

in which

$$\lambda(\mathbf{k}s, \mathbf{k}', n - n') = \int_0^\infty d\Omega \alpha^2 F(\mathbf{k}s, \mathbf{k}'s', \Omega) \frac{2\Omega}{(\omega_n - \omega_{n'})^2 + \Omega^2}$$

$$\alpha^2 F(\mathbf{k}s, \mathbf{k}'s', \Omega) = N(0) \sum_\nu \left| g^\nu_{\mathbf{k}s,\mathbf{k}'s'} \right|^2 \delta(\omega - \omega_{\mathbf{k}-\mathbf{k}',\nu})$$

$$g^\nu_{m,n}(\mathbf{k}, \mathbf{q}) = \sum_s \mathbf{e}^s_{\mathbf{q},\nu} \cdot \mathbf{d}^s_{m,n}(\mathbf{k}, \mathbf{q}) / \sqrt{2M_s\omega_{\mathbf{q},\nu}}.$$

$g^\nu_{m,n}$ given by phonon information and deformation potential matrices

Performing self-consistent calculation for mass renormalization term Z and superconducting gap Δ.