question: monoatomic tetrahedral or diatomic octahedral?
Where do "heavy" electrons come from?

(G.B. & P.F. B., Milano, last week)
What do we need?

Calculation by F. Bortignon from Thomas-Fermi screening of free electrons

\[ U(r) = \frac{e^2}{r} e^{-\alpha r} \]

\[ \sigma(E) = S(0) E^{-1} \exp \left\{ -2 \int_{r_0}^{r_1} \sqrt{2m^* \hbar^2 (U-E)} \, dr \right\} \]

rate = \langle \sigma v \rangle \times \text{density} \quad kT = 25 \text{ meV} \rightarrow 10^{-23} \text{ fusions/s. pair for } \alpha = (0.035 \text{ Å}^{-1}) \]

\[ \alpha = \left( 4e^2 \frac{\rho}{\pi \hbar^2} m^*/m \right)^{1/2} \]

T-F screening of FREE electrons

\[ \sim \left( \frac{m^*}{m} \right) a_0^{-1} \]

large effective mass from strongly CORRELATED electrons

quasiparticles \rightarrow heavy fermions
Theory of Dense H
Ashcroft et al.,
1981

\[ E \text{ (Ry/proton)} \]

\( r^3/a_0^3 \)

mono-metal

di-metal

insulator

in PdD\(_2\)
How to check these speculations

Try a real heavy-fermion system

e.g.: \( \text{UPd}_3 \)

\( \text{CeAl}_3 \)

or \( \text{CeH}_x \ (x > 2) \)

where \( m^* / m \sim 10^3 \)

(from specific heat data)