Subsituting (6) into (4) we get (to eliminate v_f)

$$v_i^2 = \frac{M}{m_e} V^2 + \frac{\left(\frac{M}{m_e} - 1\right)^2 V^2}{4}$$

$$v_i^2 = \frac{V^2}{4} \left(\frac{M}{m_e} + 1 \right)^2 \quad \text{——— (7)}$$

(3) $\Rightarrow$ $$\frac{\Delta K}{(K_e)_i} = \frac{K_{Hg}}{(K_e)_i} = \frac{M}{m_e} \frac{V^2}{v_i^2} = \frac{M}{m_e} \frac{4}{\left(\frac{M}{m_e} + 1\right)^2}$$

$$\boxed{\frac{\Delta K}{(K_e)_i} = \frac{4M}{m_e\left(1 + \frac{M}{m_e}\right)^2}}$$

M: mass of Hg atom
m_e: mass of the electron

Since $M \gg m_e$ $\quad 1 + \frac{M}{m_e} \simeq \frac{M}{m_e}$

$$\Rightarrow \frac{\Delta K}{(K_e)_i} \simeq \frac{4M}{m_e \frac{M^2}{m_e^2}} \simeq \frac{4\, m_e}{M} = \frac{4\,(5.486 \times 10^{-4}\, u)}{200.59\, u}$$

$$= \boxed{1.09 \times 10^{-5}}$$

u: atomic mass unit

This is a very small quantity $\Rightarrow$ the energy lost by the electron during the collision is very small.