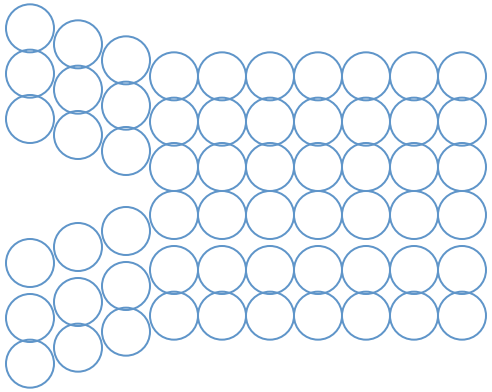
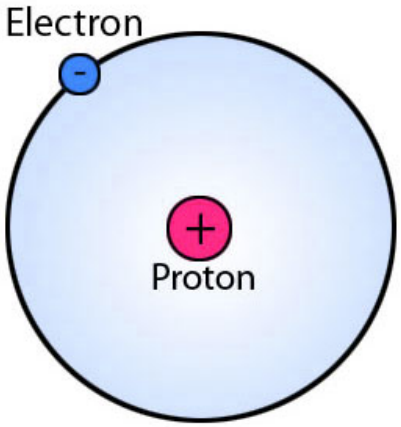
Griffith picture (1921)
Rupture of silica



$$\text{fracture energy} = \frac{\text{covalent energy of a single layer of atoms}}{\text{area}}$$

$$\Gamma \approx 1 \text{J/m}^2$$

Chemical bond



Quantum mechanics

$$\left[\frac{\hbar^2}{2m}\nabla^2+\frac{e^2}{4\pi\varepsilon_0 r}+E\right]\Phi=0$$

Length scale

$$a=\frac{4\pi\varepsilon_0\hbar^2}{me^2}=0.5\times10^{-10}\,\mathrm{m}$$

Energy scale

$$E=\frac{me^4}{2\left(4\pi\varepsilon_0\hbar\right)^2}=13.6\mathrm{eV}=25.8\times10^{-19}\,\mathrm{J}$$

Surface energy

$$\gamma\sim E/a^2=2\mathrm{J/m}^2$$

Schrodinger (1926)