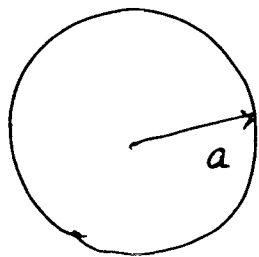


5-4 导体球壳的电容

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(1) 导体球壳 \Rightarrow 表面电荷分布

$$\phi = \frac{1}{4\pi\epsilon_0} \frac{Q}{a} \quad (r=a)$$

$$U = \frac{1}{2} Q \phi = \frac{1}{8\pi\epsilon_0} \frac{Q^2}{a} //$$

(ii) 求解

$$\begin{cases} E_r = 0 & (r < a) \\ E_r = \frac{1}{4\pi\epsilon_0} \frac{Q}{r^2} & (r > a) \end{cases}$$

$$\begin{aligned} U &= \frac{\epsilon_0}{2} \int |E|^2 d\tau \\ &= \frac{\epsilon_0}{2} \left(\frac{Q}{4\pi\epsilon_0} \right)^2 \cdot \int_a^{\infty} \frac{1}{r^4} 4\pi r^2 dr \end{aligned}$$

$$\therefore U = \frac{1}{8\pi\epsilon_0} \frac{Q^2}{a} //$$