姚岐 09300190087

首先，$\vec{E}(\vec{r})=\frac{1}{4\pi\varepsilon_0}\int\rho(\vec{r}')\frac{\vec{R}}{R^3}d\tau'$

则$\oint_L \vec{E}\bullet d\vec{l}=\oint_L\left[\frac{1}{4\pi\varepsilon_0}\int\rho(\vec{r}')\frac{\vec{R}}{R^3}d\tau'\right]\bullet d\vec{l}=\frac{1}{4\pi\varepsilon_0}\int\rho(\vec{r}')\left[\oint_L\frac{\vec{R}}{R^3}\bullet d\vec{l}\right]d\tau'$

以$\vec{r}$'为坐标原点，设$d\vec{l}$与$\vec{R}$夹角为θ，则$\vec{R}\bullet d\vec{l}=R\cos\theta dl=RdR$

$\therefore\oint_L \vec{E}\bullet d\vec{l}=\frac{1}{4\pi\varepsilon_0}\int\rho(\vec{r}')\left[\oint_L d\left(\frac{1}{r}\right)\right]d\tau'$

积分转化为一个全微分。由于积分为环路积分，即为沿着L的某一点开始，积分一圈后回到原来位置。因而积分为0.

$\therefore\oint_L \vec{E}\bullet d\vec{l}=0$，静电场的环路积分为0.