

$$\overset{\prime}{\dot{\mathbf{e}}}\overset{\dot{\mathbf{e}}}{\mathbf{e}}\\I=\frac{\dot{\mathbf{e}}\cdot\bar{\mathbf{a}}}{\sqrt{\sigma_{33}/\rho_s}};\mu=\sin(\varphi)$$

$$I=\dot{\mathbf{e}}\times\sqrt{\frac{m}{\sigma_{33}\times\bar{a}}}=\dot{\mathbf{e}}\times\sqrt{\frac{\frac{4}{3}\pi\frac{\bar{a}^3}{8}\times\rho_s}{\sigma_{33}\times\bar{a}}}=\dot{\mathbf{e}}\times\sqrt{\frac{\pi}{6}}\sqrt{\frac{\bar{a}^2\rho_s}{\sigma_{33}}}=\sqrt{\frac{\pi}{6}}\times\frac{\dot{\mathbf{e}}\cdot\bar{\mathbf{a}}}{\sqrt{\sigma_{33}/\rho_s}}$$

$$\mu=\tan(\varphi)$$

$$\overset{\dot{\mathbf{e}}}{\mu(I)}\overset{\dot{\mathbf{e}}}{\mathbf{e}}\overset{\dot{\mathbf{e}}}{\mathbf{e}}\overset{\dot{\mathbf{e}}}{\mathbf{e}}\overset{\dot{\mathbf{e}}}{\mathbf{e}}$$

$$\mu(I)=\mu_s+\frac{\mu_2-\mu_s}{1+\frac{I_0}{I}}$$

$$\Phi(I)=\Phi^{\max}-bI$$

$$\overset{\mu_s}{\dot{\mathbf{e}}},\overset{\mu_2}{\dot{\mathbf{e}}},\overset{I_0}{\dot{\mathbf{e}}},\overset{\Phi_{\max}}{\dot{\mathbf{e}}},\overset{b}{\dot{\mathbf{e}}}$$

$$0.46$$

$$0.44\qquad\qquad\qquad\mu(I)\overset{\dot{\mathbf{e}}}{\mathbf{e}}$$

$$0.42\qquad\qquad\mu_s=0.2953$$

$$0.4\qquad\qquad\mu_2=0.5329$$

$$I_0=0.0483$$

$$\mu$$

$$0.36$$

$$0.34$$

$$0.32$$

$$0.3$$

$$0.28$$

$$10^{-4}\qquad\qquad\qquad 10^{-3}\qquad\qquad\qquad 10^{-2}\qquad\qquad\qquad 10^{-1}$$

$$I$$

$$\frac{\mu(I)}{\varepsilon_{yy}}=70\%$$

$$0.605$$

$$0.6$$

$$0.595$$

$$0.59$$

$$0.585$$

$$\Phi\qquad 0.58$$

$$0.575$$

$$0.57$$

$$\Phi_{max}=0.6019$$

$$0.565$$

$$b=0.4641$$

$$0.56$$

$$\overset{\dot{\mathbf{e}}}{\Phi(I)}\overset{\dot{\mathbf{e}}}{\mathbf{e}}$$

$$0.555$$

$$10^{-4}\qquad\qquad\qquad 10^{-3}\qquad\qquad\qquad 10^{-2}\qquad\qquad\qquad 10^{-1}$$

