**Supplemental material**

**Cross-slip in Face Centered Cubic Metals: A General Full Stress-field Dependent Activation Energy Line-tension Model**

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In order to examine the estimation of the internal stresses in the MD simulations using isotopic elastic theory, we independently estimate it indirectly from the equilibrium dissociation width. Summing up the forces acting on each partial dislocation in the primary plane, leads to a relation between the equilibrium dissociation width $d\_{σ}$ and Escaig stress $σ\_{esc}$. As seen in the manuscript,$ d\_{σ}=βd\_{0}$, where $β\left(σ\_{esc}\right)=\left(1+\frac{\sqrt{3}b}{6γ}σ\_{esc}\right)^{-1}$. We note that the only assumption made here is that the elastic force between the partial dislocations is inversely proportional to the distance between them. In the case of a dipole in a periodic cell, Escaig stress is composed of the external stress applied in the MD simulations $σ\_{ext}$ and the internal one $σ\_{esc}^{(int)}$. Therefore, we can obtain a linear relation between $ 1/d\_{σ} $ and the external stresses

 $\frac{1}{d\_{σ}}=\frac{1}{d\_{0}}+\frac{\sqrt{3}b}{6γd\_{0}}σ\_{esc}^{(int)}+\frac{\sqrt{3}b}{6γd\_{0}}σ\_{ext}$. (S1)

In Fig. S1 we plot the values of $1/d\_{σ}$ as a function of the external stress, as was extracted from the paper by Oren et al. [1]. The results are linear in a large range of external stresses, and a linear fit is also shown in the figure. Considering the values obtained from the Cu interatomic potential in the MD simulations, $b=0.254 nm$ and $γ=44.4 {mJ}/{m^{2}}$, we estimated $d\_{0}=2.35nm$ and $σ\_{esc}^{(int)}=430MPa$. This is similar the internal stresses obtain by isotropic elasticity of $403MPa$, for a 20b dipole distance.

$$1/d\_{σ}$$

$$σ\_{ext }[GPa]$$

Figure S1: Inverse of the equilibrium dissociation width as a function of the external stresses. The points are the MD simulation reported by Oren et al. [1] and the line is the linear fit.

[1] E. Oren, E. Yahel, and G. Makov, “Kinetics of dislocation cross-slip: A molecular dynamics study,” *Comput. Mater. Sci.*, vol. 138, pp. 246–254, Oct. 2017.