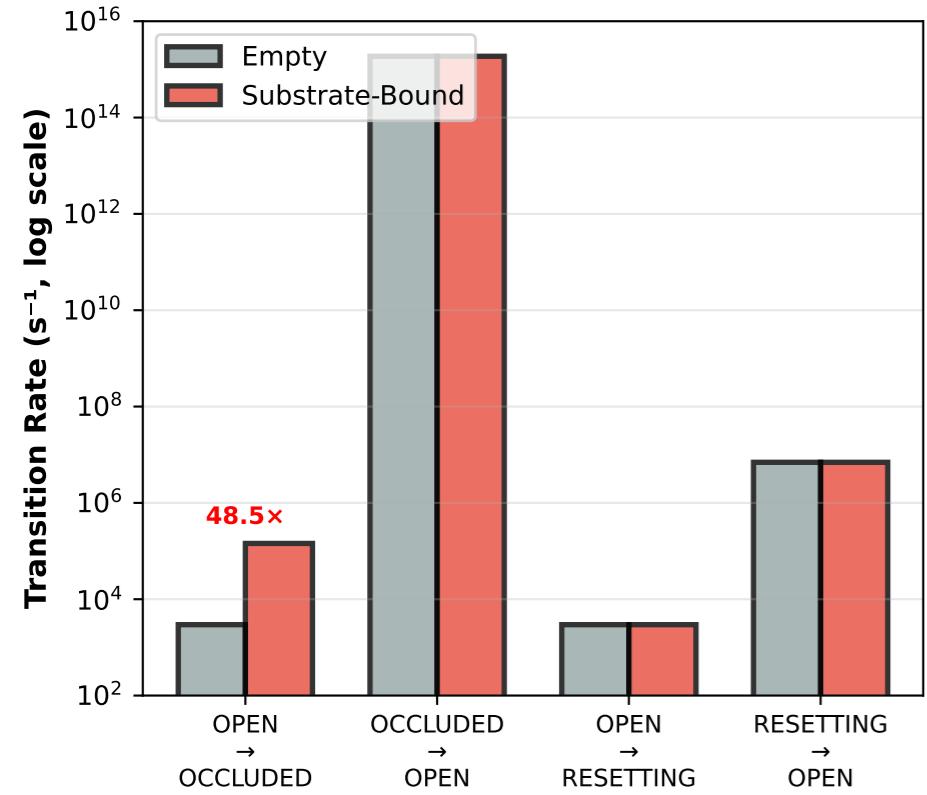
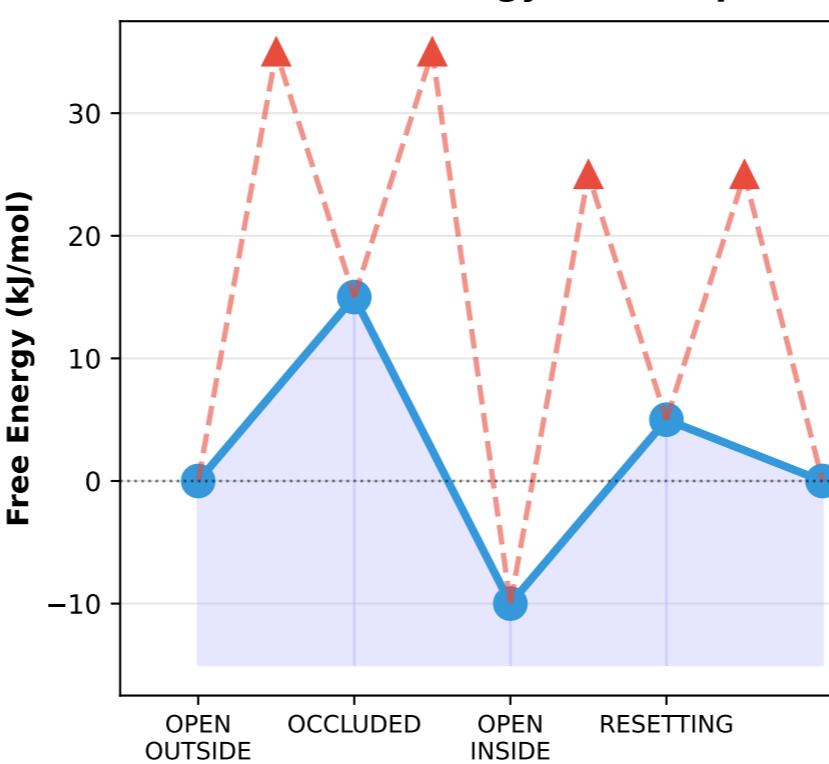


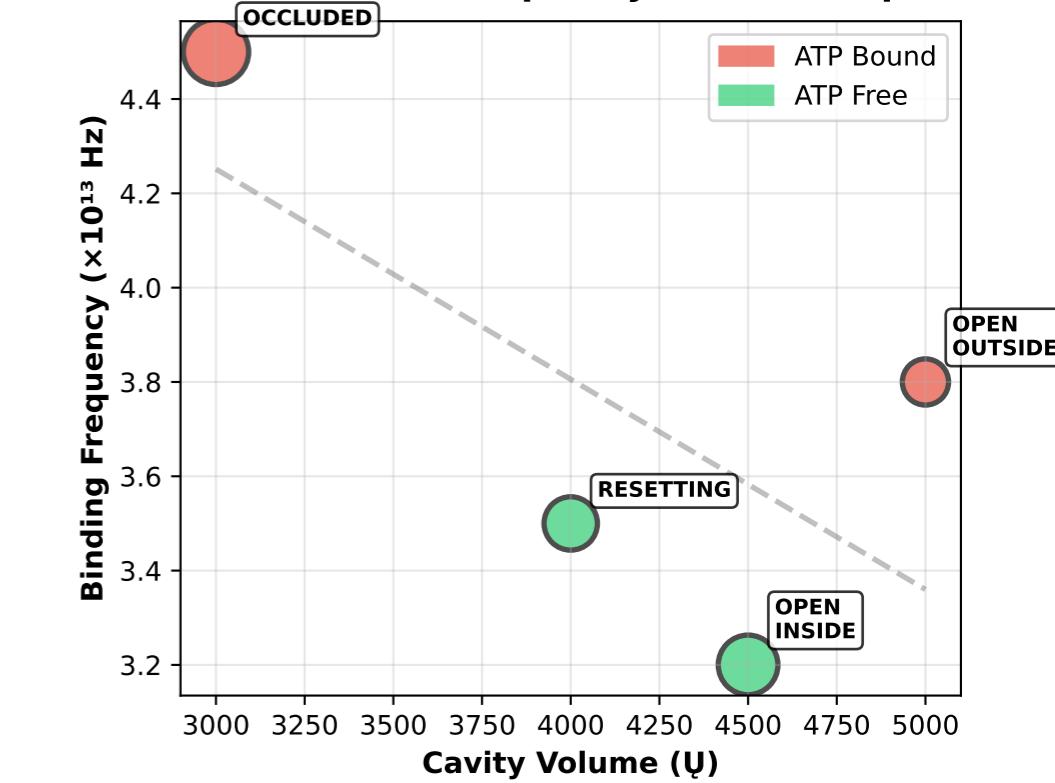
A. Transition Rate Enhancement



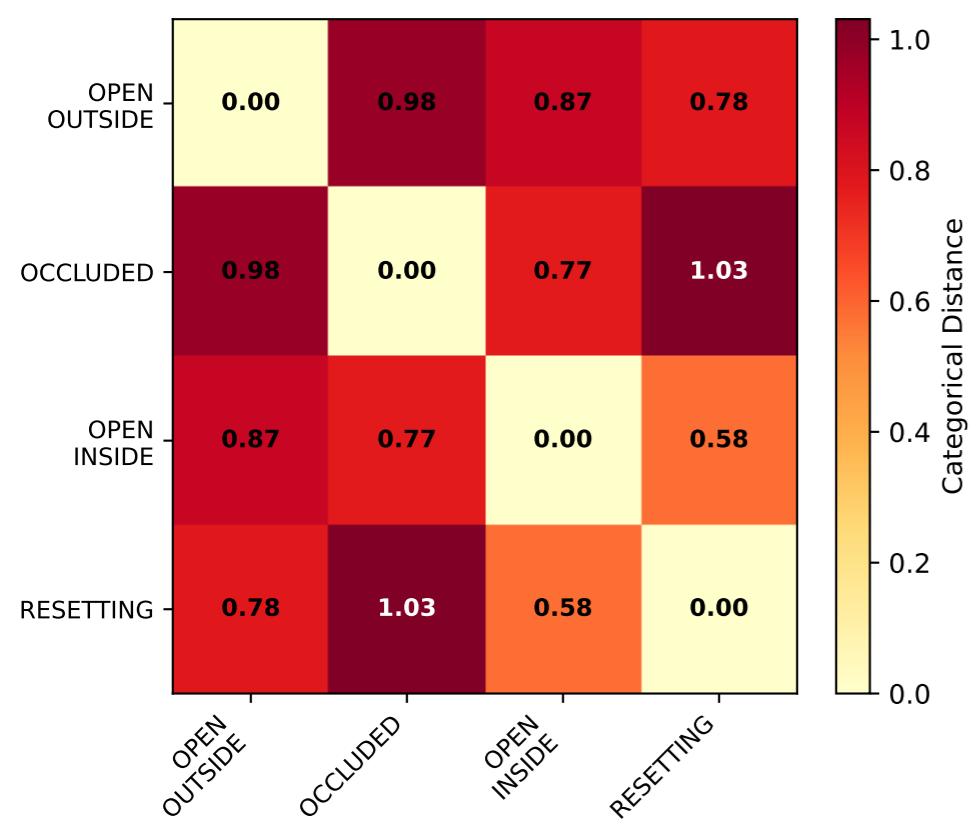
B. Free Energy Landscape



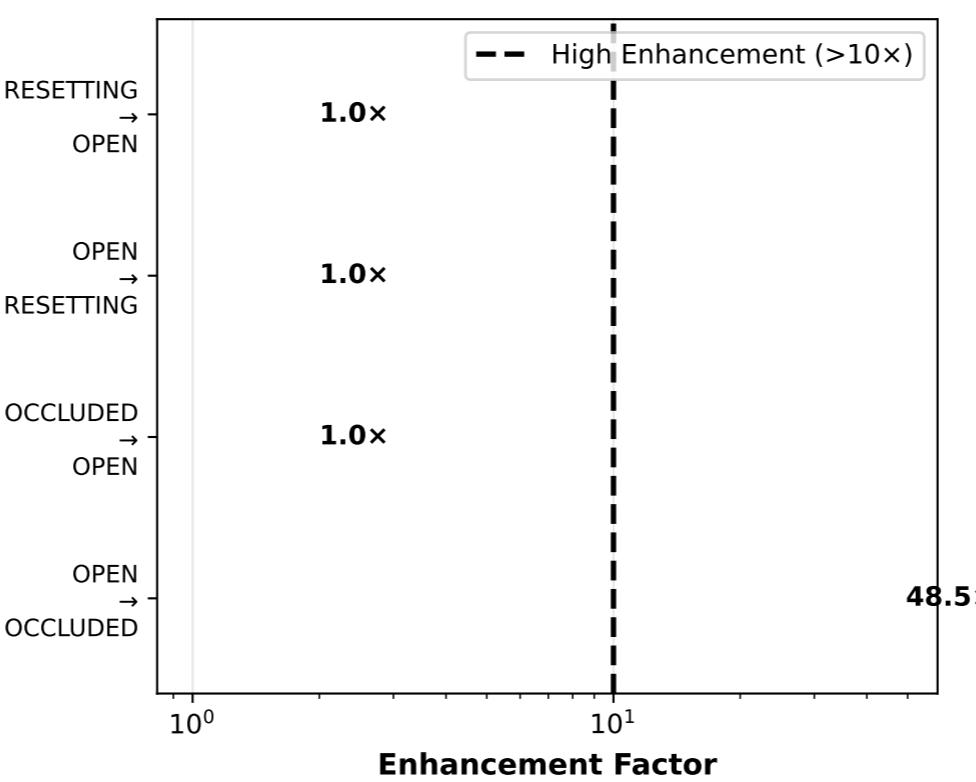
C. Volume-Frequency Relationship



D. S-Space Distance Matrix



E. Substrate Binding Enhancement



CONFORMATIONAL CYCLE SUMMARY

Total States: 4
Trajectory Points: 20
S-Space Distance: 14.73

STATE PROPERTIES:

OPEN_OUTSIDE:
Volume: 5000 U
Frequency: 3.80×10^{13} Hz
Energy: +0.0 kJ/mol
ATP: Bound

OCCLUDED:
Volume: 3000 U
Frequency: 4.50×10^{13} Hz
Energy: +15.0 kJ/mol
ATP: Bound

OPEN_INSIDE:
Volume: 4500 U
Frequency: 3.20×10^{13} Hz
Energy: -10.0 kJ/mol
ATP: Free

RESETTING:
Volume: 4000 U
Frequency: 3.50×10^{13} Hz
Energy: +5.0 kJ/mol
ATP: Free

KEY FINDINGS:

- Substrate binding enhances rate 48.5x
- Occluded→Inside transition fastest (1.87×10^{15} s^{-1})
- Energy minimum at OPEN_INSIDE (-10 kJ/mol)
- Maximum barrier at OCCLUDED (+15 kJ/mol)