

Kinetic Studies of Cu(I) Binding to Metallothionein

Maria T. Salgado and Martin J. Stillman

*Department of Chemistry, The University of Western Ontario
London, Ontario, Canada*

Metal binding reactions of MT are complex because they require a series of steps before the metal reaches a thermodynamically stable location in the binding cage of MT [1]. Emission spectroscopy was used to study the rate and specificity of Cu(I) binding to the sulfurs of MT via the LMCT emission band that results near 600 nm when the Cu(I)_n-MT complex is excited with UV light at 290 nm. The Cu(I) binding behaviours of the isolated alpha and beta domains of MT was also studied in order to understand their contribution to the binding behaviour of the whole MT protein. The unique pattern observed for the binding rates of Cu(I) ions to MT and to the individual domains gives us an insight into the binding - rearrangement - equilibrium mechanism of Cu(I) binding to MT. Furthermore, the specific emissive characteristics of each Cu_n-alpha and Cu_n-beta cluster were used to monitor a unique pathway for the formation of Cu₆S₁₁ and Cu₆S₉-clusters in the alpha and beta domains of MT respectively. This pathway requires Cu(I) exchange reactions between the two domains, which involve the migration of Cu(I) from the alpha to the beta domain of MT, followed by formation of a Cu₄-cluster intermediate localized in the beta domain of MT before any Cu(I) ions remain bound to the alpha domain [2].

[1] Martin J. Stillman, Donald Thomas, Colleen Trevithick, Xu Guo and Michael Siu. *Journal of Inorganic Biochemistry*. 79 (2000) 11-19.

[2] Maria T. Salgado and Martin J. Stillman. *Biochemical and Biophysical Research Communications*. 318 (2004) 73-80.