Metal Binding Properties of a Novel Plant Metallothionein

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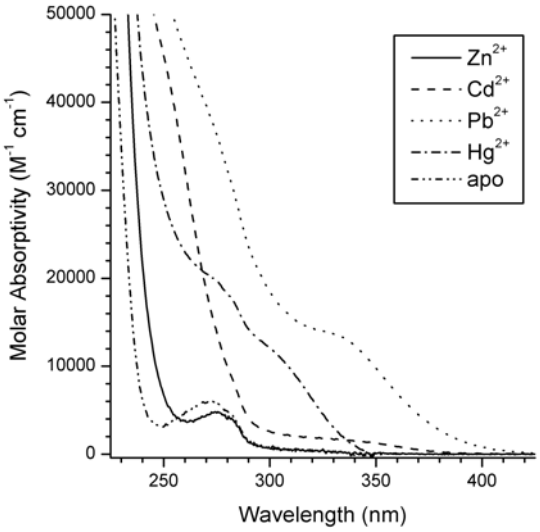
Metals are essential for life, but depending on the concentration and sort of metal ion they can also exhibit a considerable amount of toxicity. Metallothionein (MT) is one of the fascinating molecules that bind metal ions within the cells. Generally, metallothioneins are a family of small metalloproteins with an outstanding high cysteine and d^{10} metal ion content. MTs play a role in the homeostasis of essential metal ions, most notably Zn^{2+} and Cu^{+}, and the detoxification of heavy metals, such as Cd^{2+} or Hg^{2+}. Additionally, participation in gene regulation is discussed. MTs occur in nearly all kingdoms of life, but little is known about the plant isoforms. Their amino acid sequences differ distinctively from MTs of other organisms, suggesting a significantly different overall three-dimensional structure and metal-thiolate cluster formation. The protein under investigation, *M. acuminata* MT3, belongs to the plant MT fruit-specific p3 subfamily.[1] With a total of 65 amino acids, 10 of these cysteine residues, it features a cysteine content and percentage that is more comparable to fungal and prokaryotic MTs than to the well characterized mammalian isoforms. Thus, it binds a significantly lower amount of d^{10} metal ions (3-4; mammalian MTs: 7). A spectroscopic investigation of the metal binding behavior to Zn^{2+}, Cd^{2+}, Pb^{2+}, and Hg^{2+} will be presented giving rise to the existence of a weaker coordination site. A possible metal-thiolate cluster structure will be discussed.



[1] S. K. Clendennen, G. D. May, *Plant Physiol.* **1997**, *115*, 463-469.

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