The Saccharomyces cerevisiae ddi2 (DNA damage inducible 2) gene encodes an HD-domain containing metalloenzyme that is induced over 100-fold by alkylating agents such as methyl methane sulfonate (MMS) and dimethyl sulfate (DMS). A fungal homolog of ddi2 was previously characterized as a cyanamide hydratase enzyme, and ddi2 expression is also dramatically induced by addition of cyanamide to yeast growth media. To study the DDI2 protein’s biochemical function, we carried out yeast functional assays, developed an in-vitro enzyme activity assay, and solved the three dimensional structure by X-Ray crystallography. The structure reveals that ddi2 binds Zn2+ and is indeed a member of the HD-domain superfamily, and identifies key residues at the active site that likely participate in cyanamide substrate binding and catalysis.