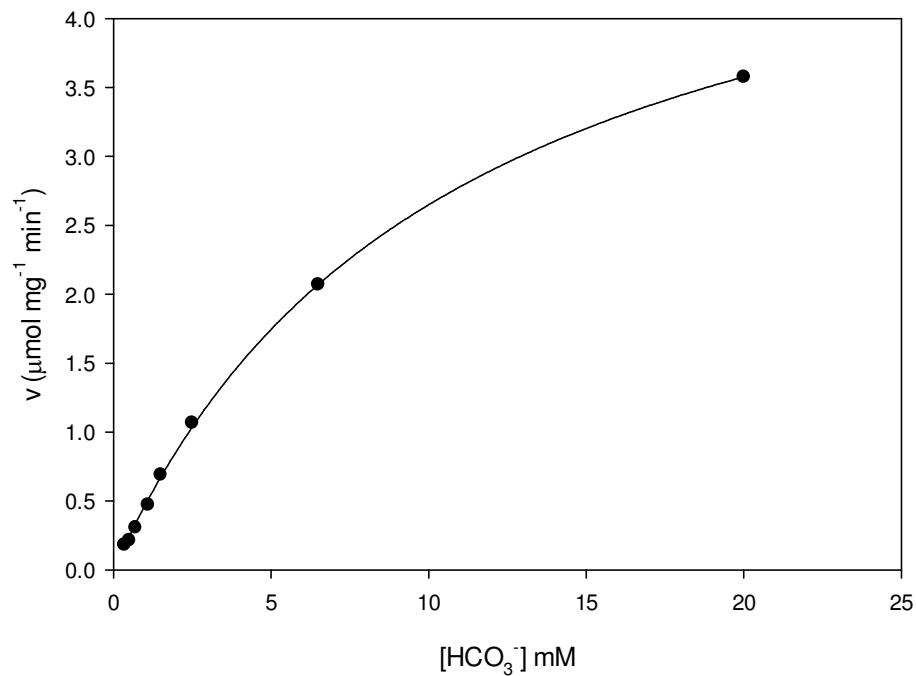


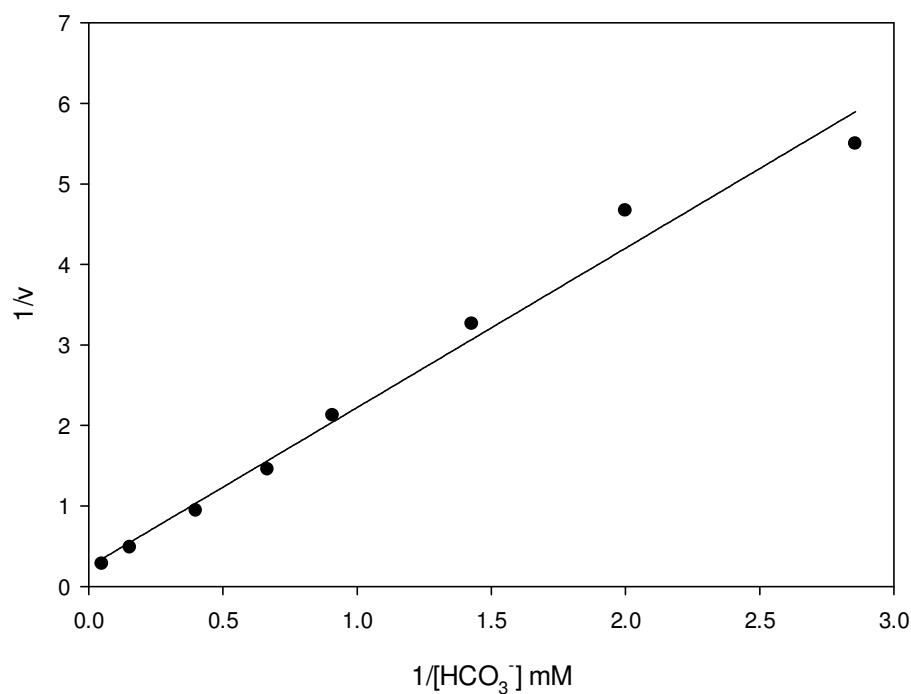
## Supporting Information

**Figure S1a.** Initial rate vs.  $[\text{HCO}_3^-]$  curve for the pyruvate carboxylation. Solid line indicates best fit line to eqn

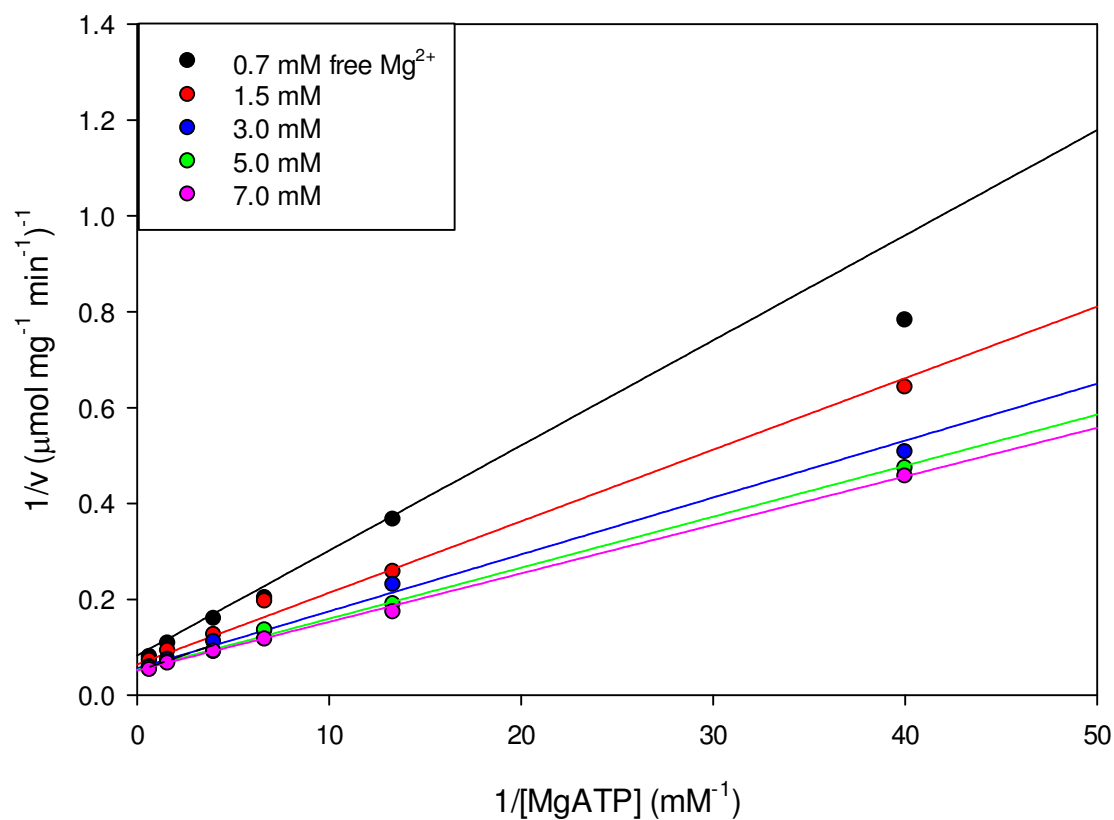
(1).  $\text{HCO}_3^-$  was varied (0.05-20 mM) and MgATP (3.0 mM) and  $\text{Mg}^{2+}$  (5 mM) were held constant.



**Figure S1b.** Reciprocal plots of initial rate vs.  $[\text{HCO}_3^-]$  curve for the pyruvate carboxylation.



**Figure S2.** Initial velocity plots for the pyruvate carboxylation reaction at variable concentrations of MgATP and fixed concentrations of free  $\text{Mg}^{2+}$ . Data were globally fitted to the equilibrium ordered eqn (eqn (2)) with  $\text{Mg}^{2+}$  binding first. Solid lines are the best fit lines determined from the global, nonlinear regression fit.



**Figure S3.**  $k_{\text{cat}}$  vs.  $[\text{Mg}^{2+}]$  plot for the activation of the phosphorylation of MgADP with carbamoyl as the phosphoryl donor. Solid line indicates data fit to linear equation with a slope of  $0.180 \pm 0.08$  and an intercept of  $0.95 \pm 0.05$ .

