

**Table III.** *Model parameters*

Symbol <sup>a</sup>	Definition	Value	Unit	Source
$c_x$	CO <sub>2</sub> concentration	Varies	$\mu\text{M}$	
$b_x$	HCO <sub>3</sub> <sup>-</sup> concentration	Varies	$\mu\text{M}$	
$\text{pH}_e$	Extracellular pH	8	–	Measurement
$\text{pH}_c$	Cytoplasmic and carboxysomal pH	7.35	–	“Results”
$k_{cf}$	CO <sub>2</sub> hydration rate constant in cytoplasm	$3 \times 10^{-2}$	$\text{s}^{-1}$	Uncatalyzed; Johnson (1982)
$k_{xf}$	CO <sub>2</sub> hydration rate constant in carboxysome	1,000	$\text{s}^{-1}$	Sufficient for equilibration
$m_R$	Rubisco content	$6.6 \times 10^{-21}$	$\text{mol active site cell}^{-1}$	This study
$K_{m-R}$	Rubisco one-half-saturation constant for CO <sub>2</sub>	263	$\mu\text{M}$	This study
$k_{\text{cat-R}}$	Rubisco maximal turnover rate	10.6	$\text{s}^{-1}$	Tcherkez et al. (2006)
$K_{m-B}$	One-half-saturation constant for HCO <sub>3</sub> <sup>-</sup> uptake	82	$\mu\text{M}$	This study
$V_{\text{max-B}}$	Maximal HCO <sub>3</sub> <sup>-</sup> uptake rate	$2.5 \times 10^{-20}$	$\text{mol cell}^{-1} \text{s}^{-1}$	This study
$N_x$	Number of carboxysomes per cell	6		Ting et al. (2007)
$f_{c-c}$	Cellular transfer coefficient for CO <sub>2</sub>	$1 \times 10^{-8}$	$\text{cm}^3 \text{s}^{-1}$	Assume diffusion limited (membrane is no barrier); Pasciak and Gavis (1974)
$f_{c-x}$	Carboxysome transfer coefficient for CO <sub>2</sub>	$2 \times 10^{-15}$	$\text{cm}^3 \text{s}^{-1}$	Fitted to data
$f_{b-x}$	Carboxysome transfer coefficient for HCO <sub>3</sub> <sup>-</sup>	$6 \times 10^{-10}$	$\text{cm}^3 \text{s}^{-1}$	Assume diffusion limited (no barrier); Pasciak and Gavis (1974)
$V_c$	Cytoplasmic volume	$1.8 \times 10^{-13}$	$\text{cm}^3$	Ting et al. (2007)
$V_x$	Total carboxysome volume	$2.3 \times 10^{-15}$	$\text{cm}^3$	Ting et al. (2007)

<sup>a</sup>Subscripts are as follows: b, bicarbonate; c, cytoplasm; e, external environment; f, forward rate constant; and x, carboxysome.

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