For a system of components $\{C\}$ with concentrations $\boldsymbol{c} = (c_0, c_1, \cdots c_n)$ joined by a set of reactions $\{R\}$ the time derivative for a single component is

$$\frac{dc_i}{dt} = \sum_{j \in \{R\}} g(i,j)\, S_{j,i}\, \mathrm{k}_j \prod_{k \in \{C\}} c_k^{S_{j,k}} \tag{1}$$

where j enumerates over reactions, $g(i,j)$ is a function that returns 1 if i is a product in reaction j and -1 if it's a reactant, S is a matrix of stoichiometries, k_j is the rate constant for reaction j, k enumerates over components in the system and c_k is the concentration of component k.