

Reaction network formulation of a gene translation system with amino-acyl-tRNA-synthetases

Eq.	Definition	Description
1	$\mathcal{M}_{GC} = Codons \cup AA^{free} \cup AA^{prot} \cup aaRS \cup tRNA^{free} \cup tRNA^{loaded}$	Definition of the molecular species in the network
2	$Codons = \{A,C,G,T\}^3 = \{AAA, AAC, \dots, TTT\}$	Set representing the 64 codons of the genetic code
3	$AA^{free} = \{Ala^{free}, Arg^{free}, Asp^{free}, \dots, Try^{free}\}$	Amino acids that are not used in a protein
4	$AA^{prot} = \{Ala^{prot}, Arg^{prot}, Asp^{prot}, \dots, Try^{prot}\}$	Amino acids that have been used in a protein during gene translation
5	$tRNA^{free} = \{tRNA_n n \in Codons\}$	Unloaded tRNAs specific for codon n
6	$tRNA^{loaded} = \{tRNA_{n,a} n \in Codons, a \in AA_{free}\}$	tRNAs specific for codon n that have been loaded with amino acid a
7	$aaRS = \{Syn_{n,a} n \in Codons, a \in AA_{free}\}$	Amino-acyl-tRNA-synthetases that are specific for amino acid a and codon n
8	$\mathcal{R}_{GC} = \{tRNA_n + a + Syn_{n,a} \rightarrow tRNA_{a,n} + Syn_{n,a} \mid n \in Codons, a \in AA^{free}\} \cup$ $\{n + tRNA_{a,n} \rightarrow n + tRNA_n + a \mid n \in Codons, a \in AA^{prot}\}$	Loading of the tRNA by suitable synthetasis
9		Translation step, i.e., the incorporation of an amino acid into a growing protein