Auxiliary Concept: Chemical Reaction & Catalysis

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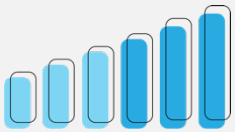
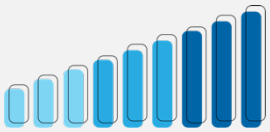
Engineering Literacy Dimension: Engineering Knowledge
Domain: Engineering Sciences
Overview: *Chemical Reaction & Catalysis* is important to engineering literacy as it is the knowledge in which engineering professionals use to analyze and design new products and processes by controlling and using chemical reactions. For example, developing more efficient catalysts can reduce the production of environmentally harmful by-products and can enable enhanced energy efficient production processes. More efficient catalysts can also lower the costs of producing important chemical products.

Performance Goal for High School Learners
I can, when appropriate, draw upon the knowledge of Chemical Reactions & Catalysis content, such as (a) *reaction rates, rate constants, and order*, (b) *conversion, yield, and selectivity*, (c) *chemical equilibrium and activation energy*, and (d) *fuels*, to analyze the factors influencing the processes of reaction and catalysis with mathematical models to solve problems in a manner that is analytical, predictive, repeatable, and practical.

	 Basic	 Proficient	 Advanced
REACTION RATE, RATE CONSTANT, & ORDER	I can define reaction rate, rate constant, and order in chemical reactions.	I can explain the factors determining reaction rate, rate constant, and order, using mathematical descriptions.	I can analyze the reaction rate, rate constant, and order with a given chemical reaction, using mathematical equations.
CONVERSION, YIELD, & SELECTIVITY	I can define conversion, yield, and selectivity and describe their relationship.	I can explain how different types of reactors (e.g. batch, semi batch, continuous, etc.) influence conversion, yield, and selectivity.	I can analyze the conversion, yield, and selectivity of a given chemical reaction, using mathematical equations.
CHEMICAL EQUILIBRIUM & ACTIVATION ENERGY	I can define the state of chemical equilibrium, describing the basic conditions of the state.	I can explain the reaction rates of the forward and backward reactions at the state of chemical equilibrium.	I can analyze how a system would react when a reactant is added at equilibrium, using mathematical equations.
FUELS	I can define the relationship between a fuel and an oxidant in terms of a chemical reaction.	I can explain the act of combustion in terms of different types of fuels (e.g. liquid, gaseous, solid fuels).	I can analyze the combustion of a fuel in terms of hydrocarbon, nitrogen, or temperature, etc., using mathematical equations.