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Commentary

Brief note on Bio Thermodynamics and Microbial Growth

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DESCRIPTION

Bio thermodynamics, in the broadest sense, includes the measurement of all thermochemical and thermo physical properties and the calculation of biochemical and biological systems. This is a very wide range of fields given its many properties and diverse biochemical systems, from relatively small molecules and simple reactions to macromolecules, cells and living organisms. Certain methods are historically and permanently important. These include combustion, heat capacity, and solution calorie measurements, electrochemical, micro calorie measurements, isothermal titration calorimetric measurements, differential scanning calorimetry, and equilibrium, density, and sound velocity measurements. Research in these areas has often been somewhat facilitated by the development of sophisticated computer-controlled equipment, but still requires careful experimental design, execution, and analysis, something that computers cannot yet do. However, along with measurements, there is an important and ongoing need for data collection, data analysis, and the development of empirical estimation methods such as Benson and other related approaches. Therefore, it is possible to create a comprehensive table of thermodynamic properties of bio chemicals. In addition, improvements in computational chemistry have made it possible to obtain accurate thermodynamic properties of small molecules in the gas phase. With further progress and the use of existing information and methods, bio thermodynamics will continue to play an important role in applications such as biochemical engineering and drug development. Our group studies the basics of thermodynamic applications in biochemical networks and explores/develops special ones.

- Thermodynamic contributions along the way to the "glassy cell",
- Thermodynamic properties in real cell polymer accumulation,
- With the thermodynamic background of biodegradation of low water solubility pollutants
- Applicability of irreversible thermodynamics for estimating decontamination rate and microbial yield coefficient.

Overview of the most important thermodynamic techniques

The calorimeter measures the heat absorbed or released by the sample during re equilibrium after a disturbance. Such failures can be caused by temperature changes (differential scanning Calorimetry), material addition (isothermal titration calorimetry), pressure changes (pressure perturbation calorimetry), or changes in water activity (adsorption calorimetry). To compare different types of calorimeters, for example B. Insulation, heat flow or power compensation equipment. In short, the fast response times of power compensator devices make them sensitive to measuring the heat of high-speed effects and revealing their kinetics. Heat flow calorimeters can improve the long-term stability of temperature and baseline signals. This is especially important when studying slow processes.

ATP and free energy

Under standard conditions, glucose reacts with oxygen during glycolysis to release Gibbs free energy. This is an exergonic reaction, which means that energy is released. To run out of this free energy, this reaction is tied to other reactions in our body. The main way this free energy is taken up by our body is the production of adenosine triphosphate (ATP) from adenosine diphosphate (ADP) by the addition of inorganic phosphate groups. The formation of ATP from ADP is an endergonic reaction, which means that energy is consumed in the reaction. By combining this reaction with the exergonic reaction, ATP can be produced.

Microbial diversity in the environment

Bio thermodynamics deals with the principles of chemical thermodynamics in biology and biochemistry. The principles of interest include the first law of thermodynamics, the second law of thermodynamics, Gibbs free energy, statistical thermodynamics, reaction dynamics, and hypotheses about the origin of life. Bio thermodynamics is currently involved in the study of internal biochemical dynamics such as ATP hydrolysis, protein stability, DNA binding, membrane diffusion, and enzyme kinetics. From a thermodynamic point of view, the amount of energy that can work during a chemical reaction is quantitatively measured by changes in the Gibbs free energy. Physics biologist Alfred Lotka sought to integrate Gibbs free energy changes with evolution. Energy transformation in biological systems.

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