Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.15119

History of polysulfides and their role in the evolution of chemical knowledge: From Ancient Egypt medicine to the discovery of oxygen

ALEXEY KAMYSHNY

Ben-Gurion University of the Negev

Presenting Author: alexey93@gmail.com

Inorganic polysulfides (S_n^{2-}) and their protonated forms play an important role in many fields of chemistry, geology, and technology. Polysulfides are found in a variety of natural aquatic systems including salt marsh sediments, aquifers, marine and limnic waters, and sedimentary pore-waters. They are formed during oxidation of hydrogen sulfide by various electron acceptors during chemical and microbially assisted processes. Polysulfides play an important role in a wide variety of environmentally relevant processes such as diagenetic formation of pyrite, sulfurization of organic matter, and reductive dehalogenation of anthropogenic pollutants. Methylation of polysulfides in natural aquatic systems leads to formation of malodorous dimethylpolysulfanes, which negatively affect drinking water quality.

Before the introduction of modern chemical nomenclature, inorganic polysulfides were known as “liver of sulfur”, “divine water”, “hepar sulphuris” and “dia sulphuris”. These compounds were used for industrial and medicinal purposes already in the ancient world. In the Alexandrian school of alchemy, the liver of sulfur played an important role for dyeing metals with golden patina and was viewed as a step to their transmutation to gold. During the Middle Ages formation of liver of sulfur by a reaction of sulfur with carbonates of alkali metals, followed by its decomposition with acid was applied as a procedure for purification of sulfur. Due to the wide range of oxidation states of sulfur, attempts to explain transformations of sulfur-bearing compounds, including polysulfides, were made in the framework of phlogiston theory. At the end of the phlogiston era, due to their ability to react quantitatively with oxygen, polysulfides played a crucial role in experiments of Joseph Priestley, Carl Wilhelm Scheele and Henry Cavendish, which led to the discovery of oxygen.