# Amino acids adsorption on pyrite surface by XPS: role of environmental conditions

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**Abstract**

The study of the interaction and reactivity of amino acids and peptides on mineral surfaces plays a relevant role in astrobiology field, such as prebiotic chemistry through adsorption processes or catalytic properties of the mineral. Furthermore, it is significance for space missions through mission instruments to identify biomarkers for life detection, as well as astrochemistry through delivery of biomolecules by interstellar dust grains in comets and meteorites [1,2]. The physico-chemical properties of the interaction between biomolecules and mineral surfaces depend on the nature of the mineral (chemical composition, surface charge, crystal structure...), the biomolecule (solubility, chemical and electronic structure...) and the environmental conditions (atmosphere, temperature, radiation, pH...). Based on Huber and Wächtershäuser theory of "iron-sulfur world", some of these features have been studied in the last years [3-5].
In this prebiotic chemistry context, we study the adsorption of amino acids molecules on pyrite (FeS2) surface under different experimental conditions such as pH, temperature and ultraviolet irradiation (UV), by X-ray Photoemission Spectroscopy (XPS) characterization, with special attention to molecular reactivity of the pyrite surface under environmental conditions.

Pyrite surface was previously exposed to different environmental conditions: acidic and basic solutions, temperature range and UV radiation. The appearance of oxides and sulfates on the surface suggests changes on the reactivity and adsorption process on pyrite. Amino acids were adsorbed from solution on pyrite surface, and characterized in ultra-high vacuum conditions (UHV) by a surface science technique namely XPS. XPS provides information about how environmental (surroundings) conditions drives the chemical state of the molecule and the molecule-pyrite interactions. These studies contribute to the understanding of the role of environmental conditions on mineral surfaces, besides the chemical reactivity of amino acids. Mineral surfaces, acting as adsorbents, templates and catalysts, might have played a key role in the emergency of life, having implications for early Earth studies and the iron-sulfur world theory.

**References**

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