

# The Geochemistry of Deep Nitrogen

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Nitrogen is the most abundant element in the Earth's present atmosphere, and nitrogen has been used to constrain the origin of Earth's volatiles, as well as the evolution and interaction of Earth's different reservoirs. Moreover, nitrogen in the form of  $\text{NH}_3$  was an important ingredient for the abiotic synthesis of biomolecules, and may also have played an important role in modulating the climate on the early Earth, resolving the faint young Sun paradox. However, the most massive reservoir for nitrogen is likely the Earth's interior, rather than the atmosphere, which may contain up to 10 times the atmosphere's nitrogen mass. Furthermore, the origin and evolution of Earth's nitrogen remains poorly understood. Therefore, in order to better understand the Earth's nitrogen systematics, a thorough investigation of nitrogen geochemistry at conditions of the Earth's interior is required. This would include the study of nitrogen solubility in mantle minerals that can be used to constrain the nitrogen distribution and storage capacity of the Earth's mantle, the study of nitrogen solubility and partitioning in fluid and silicate systems that can be used to constrain the nitrogen degassing efficiency of the Earth's mantle, the study of nitrogen solubility and partitioning in subduction zones that can be used to constrain the efficiency of deep nitrogen subduction over Earth's history, and the study of nitrogen solubility and partitioning in Fe-rich alloy and silicate melt systems that can be used to constrain the nitrogen distribution in Earth's metallic core and silicate mantle and the potential origin of Earth's nitrogen. In this talk, I will present a brief review of the most recent advance in nitrogen geochemistry achieved from high-pressure experiments, including nitrogen geochemistry in mantle minerals, nitrogen geochemistry during genesis and degassing of magmas, nitrogen geochemistry in subduction zones, and the nitrogen geochemistry during core-mantle segregation. In addition, I will present some new data of nitrogen solubility and partitioning in Fe-rich alloy and/or silicate systems.