



Contribution ID: 28

Type: **not specified**

## Composition, physical properties, and thermal state of the core

*Thursday, 7 January 2016 16:00 (30 minutes)*

Recent advance in high-pressure mineral physics of the Earth's central regions are reviewed. The density of the core is lower than that of pure iron under the core conditions. Recent analyses of the equation of state and the sound velocity of solid and liquid iron and iron–nickel alloys strongly suggest that the core contains light elements. Possible candidates for the light elements in the core are considered to be Si, S, O, C, and H. Although both inner and outer core should be composed of combinations of these light elements, the light element abundance may be different between the outer and inner cores if the inner core is crystallized from the liquid core due to the element partitioning between solid and liquid metals. The nature and amounts of light elements in the core are the key to clarify the early processes of formation of the Earth. The phase relations, compression, and sound velocity of iron–light–element alloys have been studied intensively based on the static experiments, shock compression, and theoretical works such as ab-initio calculations. I will review the present status of these works and discuss their implications for the compositions of the outer and inner cores. To achieve a definite conclusion on the light element contents of the core, we need to establish pressure scales at the high pressure and temperature of the Earth's core, and to measure the density and sound velocity of the iron–light–element alloys covering the pressure and temperature conditions of the inner core.

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**Session Classification:** Recent progress of history, structure, chemical composition of deep Earth II