

# Essential Terms

## Adiabatic

Without loss or gain of heat. (*Chambers Dictionary of Science and Technology*); Applied to the changes in temperature, pressure, and volume in a parcel of air that occur as a consequence of the vertical movement of the air, and without any exchange of energy with the surrounding air. (*Oxford Dictionary of Earth Sciences*)

Adiabatic gradient:  $(dT/dz)_{\text{adiabatic}} = (\partial T/\partial P)_S(dP/dz)$  (*Stacey, Physics of the Earth*)

## Eutectic/Solid solution

Eutectic system: mixture of two or more minerals in definite proportions which have crystallized from a melt of solution simultaneously. The temperature at which this occurs is the eutectic point. (*Oxford Dictionary of Earth Sciences*)

Solid solution: solid crystalline phases representing a mixture of two or more end-members and which may vary in composition within finite limits without the appearance of another phase. (*Oxford Dictionary of Earth Sciences*)

## Geodynamo

Dynamo: Electromagnetic machine which converts mechanical energy into ac or dc electrical supply. (*Chambers Dictionary of Science and Technology*)

Geomagnetic dynamo: The magnetohydrodynamic mechanism, by which the geomagnetic field is believed to be generated. (*Stacey, Physics of the Earth*)

## Homogeneous accretion/Heterogeneous accretion

Homogeneous accretion: A model for the accretion of planetary bodies from the primitive solar nebula (PSN) in which the rate of accretion is fast relative to the rate at which the PSN cools. The consequence is that each body forms very quickly and consists entirely of material that was in equilibrium with the physical conditions of the PSN over only a very short period of time. According to this model, the layered structures of the planets are entirely of secondary origin.

Heterogeneous accretion: A model for the accretion of the planetary bodies from the PSN, in which the rate of accretion of solid particles into the planets is slow relative to the rate at which the PSN cools. The consequence is that the surface layer of each body at any one time is in equilibrium with the pressure and temperature conditions prevailing in the nebula, and thus each planet accretes successive “onion-skin” layers of material with different compositions. According to this model, the layered structure of planets may be partly of primary origin. (*Oxford Dictionary of Earth Sciences*)

## Latent heat/ Primordial heat/ Radiogenic heat

Latent heat: The heat required to activate a phase change from a solid to a liquid or from a liquid to a gas, i.e., to a higher energy state (e.g. The latent heating of melting). Latent

heat is released by reactions in the reverse direction (e.g. Latent heat of crystallization). (*Oxford Dictionary of Earth Sciences*)

Primordial: The period of time at, or just before, the final formation of the Earth.

Radiogenic heating: The thermal energy released as a result of spontaneous nuclear disintegrations. In the Earth, the major isotopes concerned today are of the elements uranium, thorium, and potassium, but various short-lived isotopes may have been important during the early formation of the Earth.

## **Liquidus/ Solidus**

Liquidus: In a temperature-composition diagram, the liquidus is the locus of points marking the boundary above which the phases are all liquid. In a binary system, it is represented by a line, in a ternary system by a curved surface, and in a quaternary system by a volume. Between the liquidus and the solidus, both liquid and solid phases are present.

Solidus: The position of points marking the boundary between complete solid and liquid/solid at equilibrium, in a temperature-composition diagram. (*Oxford Dictionary of Earth Sciences*)

## **Suggested Readings:**

Boehler, R. (2000) *Rev. Geophys.* **38**, 221-245.

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Labrosse, S., Poirier, J.-P. & Mouel, J.-L. L. (2001) *Earth Planet. Sci. Lett.* **190**, 111-123.

Li, J. & Fei, Y. (2003) in *The Mantle and Core*, ed. Carlson, R. W. (Elsevier, Amsterdam), Vol. 2, pp. 521-546.

Murthy, R., Westrenen, W. v. & Fei, Y. (2003) *Nature* **423**, 163.