Dear A-game team members,

The objective of this assignment is to define what an “End-Member Phase” is on a binary phase diagram and show how it relates to the subject of geology. These definitions directed at an audience of board members or investors who may not have a lot of background geologic knowledge. This report is being written to give some background on mineral formation and mineral properties, specifically to relate it to conditions of rock formation. The definitions and other examples in this report will be used to thoroughly explain “End-Member Phases”.

Thank you for reviewing my first assignment on definitions.

**Parenthetical Definition:**

Forsterite and Fayalite are the two end-member phases (most pure extremes) of olivine.

**Sentence Definition:**

One mineral can come in many forms depending on the elements that are present in its crystal structure during formation, End-Member Phases are possible forms of the same mineral that showcase the most extreme versions of this mineral.

**Extended Definition:**

**End Members of a Mineral Phase Diagram**

One mineral can come in many forms depending on the elements that are present in its crystal structure during formation, End-Member Phases are possible forms of the same mineral that showcase the most extreme versions of this mineral. **The** term “End-Member” is derived from the words “end”, which in reference to mineral phases means “The initial or the terminal point.”, and “member”, which means “A part of a whole.” Many minerals do not have a static formula, or form, and thus require complex phase diagrams to explain their constituents under different conditions of formation. End-Member phases showcase the extreme possibilities of mineral configuration. A binary phase diagram for the mineral Olivine (Fe, Mg)2SiO4and its two end-members, Forsterite Mg2SiO4 and Fayalite Fe2SiO4 are shown in Figure 1.



**FIGURE 1: Binary Phase Diagram for Olivine**

**Historically, phase diagrams** are commonly used by scientists for the prediction of composition and state phase of substances (minerals) over a range of different conditions, commonly temperature and pressure. The concept of phase diagrams are based on van der Waals work from 1873, which implies that there are coexisting liquid and gas phases below a critical temperature of real gases. This concept is applied to phase diagrams of liquid (melt) and solid when referring to mineral formation. Figure 1 depicts a phase diagram for olivine with the variable conditions being temperature, in degrees Celsius, and the Magnesium to Iron content represented by the End Members, of a produced mineral at a constant pressure. End-Member phases are used in conjunction with phase diagrams to calculate possible percentages of mineral constituents that form in any one system. This principle is a useful tool for geologists and can be used in to back out the conditions of formation of rocks with a certain composition of minerals.

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