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**Solid Earth Discussions**

# *Interactive comment on* "An experimental study of pyroxene crystallization during rapid cooling in a thermal gradient; applications to komatiites and chondrites" *by* S. Bouquain et al.

**M. D'Antonio (Referee)**

masdanto@unina.it

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General Comments

The article deals with the description and discussion of a series of experiments carried out on some mafic synthetic compositions in the CMAS system, rapidly cooled in a thermal gradient. The experiments were aimed at simulating and, thus, better understanding the formation of spinifex-textured pyroxene in natural rocks such as komatiites and chondrites. The results of the variable experiments are discussed and compared with textural features of natural komatiites. The manuscript represents a good contribution to the scientific progress, although some refinements are required to better



focus the article in relation to what is intended in both title and abstract, as detailed in the Specific Comments. The experimental work does not show any particular flaw, as it can be inferred from the detailed description of both run conditions and results. However, details should be provided on electron microprobe data, particularly on their precision and accuracy, although these data are not a main issue of the article. The figures are of good quality, although there is some mistakes in their quoting, as detailed in the Minor Comments. Finally, the language shows some small flaws, particularly in the verbs accordance. Several suggestions to improve it are provided in the Technical Corrections.

Specific Comments

1 - One main criticism to the article is that, despite what stated in the title and abstract, there is not a thorough application and comparison of the experimental results to chondrites, apart from a hint given in the very last sentence of the discussion, on page 242. The Authors should either fill this gap or delete any reference to chondrites both in the title and here and there in the text (e.g., abstract and introduction), or again state that their results might be applied to chondrites, but that has not be made in their work.

2 - The second comment regards the complete lack of any discussion on the role that iron, missing in the starting material, could or could not have had in the crystallization kinetics of synthetic and natural komatiites. Since iron is not a minor constituent of natural komatiites, this issue should be touched on at least. Similarly, the role of water should also be addressed in the discussion, as water is thought to have been significantly high in some natural komatiitic magmas, at least.

Minor Comments

Page 229, rows 6-8: There is a reference to an article (Bouquain et al., 2009) that, according to what stated in the References' list, has not been published yet. This is a little embarrassing, since that article is called as a "companion paper" and there is no possibility to check for any overlaps between the two. Furthermore, the Authors should

verify whether or not the Journal accepts references to unpublished manuscripts.

Page 231, row 28, and Table 3: Please, provide some analytical detail on the electron microprobe data, including precision and accuracy, as well as analytical conditions (e.g., beam current and size, counting times).

Page 235 and followings: Here there is some confusion in quoting figures and/or their order of appearance. At the beginning of the page, figure 4 is quoted, and after a few sentences, figure 7 is quoted. Then, figure 5 is quoted many times. On page 236, figure 8 is quoted before figure 6. The Authors should either quote figures in a different sequence, or change the order of figures. There are also some wrong figure quoting in the text, that are outlined below.

Page 236, row 1 and row 19: Please, provide some analytical detail on this “strongly zoned” glass.

Page 236, row 14: As the Authors speak about the chemical composition of olivine crystals, it would be useful to see it projected on the diagram of figure 4, even though these olivines have no FeO.

Figure 8: Please, check the scale bars: they report lengths in mm, rather they seems to be microns.

Technical Corrections

Page 228, row 3: Change “cooling” with “cooled”

Page 228, row 10: Change “reproduceability” with “reproducibility”

Page 229, row 2: Insert “they” between “which” and “found”

Page 229, row 20: Delete “that”

Page 229, row 23: Delete “one”

Page 229, row 25: Change “understand” with “understanding”



Page 230, row 3: Change “Pétrogaphiques” with “Pétrographiques” Change “in” with “at”

Page 230, row 5: Insert “on” between “pigeonite” and “the liquidus”

Page 230, row 22: Delete “the” after “preventing”

Page 231, row 2: Change “are” with “were” Change “match” with “matched”

Page 231, row 17: Change “or” with “to”

Page 231, row 22: Change “heat” with “heating”

Page 231, row 23: Change “at the hot hand” with “i.e., the hot end”

Page 232, row 2: Change “an interval of uncrystallized liquid” with “the liquid remained uncrystallized”

Page 232, row 10: Change “position in charge” with “position in the charge”

Page 233, row 5 Change “varying” with “variable”

Page 233, row 6: Change “throughout in the capsule” with “throughout the capsule”

Page 233, row 18: Change “Some experiments” with “In some experiments the charges”

Page 233, row 21: Delete “the”

Page 233, row 24: Change “was” with “were”

Page 234, row 1: Change “hot hand and” with “hot hand, and” Change “cool hand.” with “cool hand, respectively.” Insert a comma after “Yet”

Page 234, row 8: Change “employed” with “carried out”

Page 234, row 10: Change “in” with “on” Delete “appropriately”

Page 234, row 22: Change “appears” with “appeared” Change “has” with “had”

Page 234, row 23: Change “forms” with “formed” Delete “that are”

Page 234, row 24: Change “a fraction of the liquid” with “some liquid”

Page 235, row 2: Change “The results are” with “The results of all experiments”

Page 235, row 13-14: Change “in any of isothermal” with “in any of the isothermal”

Page 235, row 15: Delete “in the starting material” (the starting material was made up of pure oxides)

Page 235, row 18: Insert “either” between “have” and “euhedral”

Page 236, row 3: Change “disintegrated but” with “disintegrated; however, it has been observed that”

Page 236, row 5: Change “olivine coexists with pyroxene, the forsterite habit” with “forsterite coexists with pyroxene, its habit”

Page 236, row 19: Change “to starting” with “to the starting”

Page 236, row 23: Change “coexist” with “coexisted”

Page 236, row 26: Change “appears” with “appeared”

Page 236, row 28: Change “occurs” with “occurred”

Page 237, row 2: Change “Figure 6e” with “Fig. 8e”

Page 237, row 3 and followings: Change “Fig. 6” with “Fig. 8”

Page 237, row 16: Delete “(Fig. 2)”, it has been quoted shortly before.

Page 237, row 28: Change “Silica phase” with “A silica phase”

Page 238, row 9: Change “the presence of a” with “a control of the”

Page 238, row 11: Change “very” with “actual”



Page 239, rows 11, 15, 16 and 17: Maybe “depressed” is more appropriate than “suppressed”

Page 239, row 25: Change “Fig. 5f” with “Fig. 6f”

Page 240, row 3: Change “Fig. 5c” with “Fig. 6c”

Page 240, row 5: Change “Fig. 5a” with “Fig. 6a”

Page 240, row 10: Change “curved” with “rounded”

Page 241, row 3: Change “as” with “an”

Page 242, row 1: Change “REFS” with some relevant references

Page 242, row 5: Change “the depths” with “depth”

Page 242, row 5: Change “grew” with “had”

Page 242, row 8: Change “mantles” with “rims”

Page 247, Table 3: Put a space between “experiments” and “#CPX15” Provide some analytical details.

Page 248, caption to figure 1: Change “procedures of cooling” with “cooling procedures”

Page 250, caption to figure 3: Change “ternary” with “ternary diagram” Change “are also shown from Fig. 4” with “are shown in more detail in Fig. 4”

Page 251, caption to figure 4: Change “drawn” with “projected”. For completeness, the analyses of olivines should be projected too.

Page 252, caption to figure 5: Change “shawn” with “shown”

Page 253, caption to figure 6: Change “quenched” with “quenching”

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Interactive comment on Solid Earth Discuss., 5, 227, 2013.