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Interactive comment on “Picroilmenites in Yakutian kimberlites: variations and genetic models” by I. V. Ashchepkov et al.

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I found this manuscript very difficult to evaluate. It certainly contains an immense quantity of data and from the list of references and the depth of the discussion, it represents a profound study of an important phase in kimberlites. The problem is that, try as I might, I was not able to obtain a clear picture of exactly what the authors were trying to say. I will explain the problems in the following text and make many suggestions on what must be done to improve the manuscript. The list is long, but I want to emphasize that the paper has great potential and should certainly be published, but only after major revision and total rewriting. Only after this is done will it be possible (for me at least) to properly evaluate the scientific content of the manuscript and assess the authors' model for ilmenite formation.

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One immediate problem is the complexity of the diagrams, which makes them extremely difficult to interpret. I recommend very strongly that ALL the diagrams be simplified. It is not useful to include, for example, a REE and a spidergram for ilmenites from each pipe in each kimberlite field (38 diagrams in all; Figs 15 to 18). These diagrams could be included in an appendix for the few kimberlite specialists who will need to consult them. For the average reader, it will be much more useful to select a limited number of diagrams that illustrate the main features and focus the discussion of only these diagrams. The same applies to Figs 4 to 7 and Figs 11 to 14. The figures showing the melt compositions (Fig 19) and melting models (Fig 21) should also be simplified – show fewer examples of parental melts (a maximum of about 5 per diagram) and fewer degrees of melting. Finally the “starry night” diagram (Fig. 22) is totally incomprehensible. It must be redrawn with fewer examples – perhaps split into several diagrams.

I insist on the need to simplify the diagrams because I went to them (in vain) to try to work out what was being said in the text. The abstract is okay, a bit dense, but I thought I would be able to understand it better after reading the body of the manuscript. Problems started immediately. The message in the first paragraph is very simple, but obscured by the excessive number of references – there is no need for so many. Then, in paragraph 3, we find an account of very detailed textural and compositional features in ilmenites without any preceding description of the general features of this mineral. It is essential that the paper starts with an account of general account of the occurrence of ilmenite in kimberlites – How abundant is it? Is it always present? What are the size and the form of the grains? Does it occur as the sole megacryst phase or together with olivine, pyroxene, garnet, etc. It would be better to use many more photos – those shown in Fig 2 are of little use. The description in section 3.1 provides more information, but it consists of a list of examples of specific textures with no attempt to describe the general features.

In the 5th paragraph we read “comparing megacryst and xenoliths compositions from

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>90 kimberlite pipes . . .”. Does this mean that the authors compared the compositions of ilmenites that occur as megacrysts with those within intact peridotite(?) xenoliths?

Then, from section 3.2 onwards, we find a dense description of specific chemical features of ilmenites in individual kimberlite pipes. I doubt that any reader will have the patience to read through these pages . . . most will skip to section 5 (which will be of interest only to those working directly with geothermometers and geobarometers), then to section 8. There he/she will try to understand the differences between the three geochemical groups – and will not be able to do so because the distinctions are not evident in the 38 diagrams presented in Figs 15 to 18. It is essential to add a schematic diagram that illustrates the three groups.

Then comes the discussion. I have now read section 9.1 many times, line by line, and still am not sure what is being said. One problem is that each sentence is too complicated, with too many references to aspects that are not crucial to the argument. For example, consider the sentence “However, direct calculations for clinopyroxenes coexisting with ilmenites and orthopyroxenes from ilmenite intergrowths and from quenched nodules show a pressure interval from 6.0 to 4.0 GPa suggested for the crystallization of megacrysts suite including type II diamond.” (I have eliminated the 7 references that make the sentence more difficult to follow). This sentence contains an important message – one crucial to the authors’ thesis. This message is that the ilmenites did not crystallize at a single depth, but a various depths. However, the message is obscured by the references to “clinopyroxene”, “orthopyroxene”, “intergrowths”, “quenched nodules” (whatever these are) and “type II diamond”. Almost every sentence is like this, and the total effect is to make the text almost impenetrable.

I think the main idea that the authors are trying to transmit is that the ilmenites formed during three separate processes that acted at different depths in the lithosphere. Group 1 ilmenites formed during high-temperature metasomatism at the base of the lithosphere Group 2 imenites formed by crystallization and assimilation during the creation of kimberlite feeders Group 3 “crystallized in the metasomatic front under the rising

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protokimberlite source” from “segregated partial melts from metasomatic rocks”

These ideas, which I extracted from the abstract, are very interesting and potentially provide important constraints on the formation of ilmenites and their host kimberlites. But in the present state of the manuscript I found it impossible to obtain a clear account of what the authors mean when they use terms such as metasomatism (from which type of fluid at which depth), “kimberlite feeders”, and “segregated partial melt”. And if it is impossible to understand individual terms, sentences and paragraphs, it is impossible to understand the scientific content of the manuscript.

Specific comments: The following is another example of an incomprehensible sentence: “In these conditions the reaction of the relatively oxidized CO₂ rich fluid and melts were reacted with the reduced peridotites and eclogites which was accompanied with the crystallization of newly formed diamonds which could coat the microdiamonds formed in the ancient times.” I think you mean to say “In these conditions, the reaction of relatively oxidized CO₂ rich fluid and melt with reduced peridotite and eclogite was accompanied by the crystallization of newly formed diamonds that coated older microdiamonds.” The changes are subtle, but necessary if the text is to be understood easily by a casual reader. The average reader will not have the patience to try to understand the differences in chemical compositions of ilmenites in all the kimberlite pipes. I recommend that most of the comparisons between ilmenites from all of these pipes (Dalnaya, Zarnitsa, Osennyaya, Bukovinskaya etc etc) be removed and only the general trends are discussed. Fig 1. The map has a typical “Russian” legend with symbols identified by numbers whose meanings are explained in the caption. It is much easier on the reader if the explanations are written on the figure itself. Write “Siberian platform” ... etc on the figure and not in the caption. Fig 3. In Arabic folklore a MARID “(Arabic: مَرِيد) is a large and powerful jinn”. In a geological text one cannot use MARID as a noun: you have to say “MARID-type” xenolith or “MARID-suite” inclusions.

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