



Dissertation review

**Title: Wildfires in Polluted Areas: Mineralogical Transformations and Remobilization of Metal(loid)s**

Author: Marek Tuhý

Doctoral student Marek Tuhý was dealing with effects of wildfires on soil contaminants in vicinity of high emission sources. The dissertation thesis constitutes of 70 pages of summarizing text, which is amended with 5 annexes. Three annexes first authored by Marek Tuhý are scientific papers in respected journals with high impact factors i.e. from 6 to 8, suggesting substantial contribution of applicant to the write up. The annexes also include paper (Annex V) in a popular science journal first authored by Marek Tuhý but this paper is in Czech. Despite the quality of this paper, which I read with interest, I consider the inclusion of paper unsuitable with regard to the fact that thesis itself was written in English. Moreover, Annex V was referenced in thesis only once in a figure caption on page 14. From my point of view, it would be much more relevant to include the supplementary materials of the scientific papers in Annex I-III, which were cited in text frequently (e.g. page 19, 25, 26, 33, 35, 41, 42 etc.). Absence of the supplementary materials causes difficulties for the reader.

After reading, I can conclude that the summarizing text of this dissertation has a logical structure an overall is well written. In the introduction, I read with interest and learned a lot of interesting facts about the wildfires in general. Especially, the part focused on experimental performance of wildfire experiments was very informative and interesting. Following three chapters summarize main results of metal(oid)s speciation in the contaminated topsoil, distribution of mercury in topsoil and associated emissions of mercury and metal(oid)s during wildfires.

For the discussion, I have following questions and remarks: One of the experimental approaches used to simulate the wildfire effects on topsoil applies the set-up with ICP-OES online detection and stream of Ar as a carrier gas. With respect to the natural wildfires this approach is limited by low oxygen availability. Would oxygen-rich condition affect the release of the individual studied elements? Please comment.

In the part dealing with mercury during the combustion, despite the fact that this complicated task yielded unclear results, I would like to acknowledge efforts to assess Hg speciation in the studied polluted soils (chapter 5) using advanced methods such as XANES. Possibly one of the reasons could be relatively low Hg concentrations in the studied topsoil and vegetation when compared to other contaminated sites. Please comment.

In general, this work contains minimum of formal errors but it seems that the units or digits of Hg concentrations in topsoil and vegetation on page 42 are incorrect, are they?

When discussing the possible source of HgS in topsoil at page 43, did you consider that the origin of HgS could be the organic material itself? Manceau et al. (2018) found metacinnabar nanoparticles in green leaves using HR-XANES method. Please comment.

In the final part of this chapter, you provided an estimate of possible re-emission of mercury from contaminated topsoil. I am missing a comparison to some of the most recent global annual wildfire Hg release estimates such as in Global Mercury Assessment 2018. Please comment. In the next part on release of metal(oid), I do not understand the reason for low level of grass samples homogenization. Considering the continuous temperature combustion experiments with online ICP-OES detection, would it make any sense to use some reference materials such as in case of Hg? I disagree with the last sentence on page 51, as it is written, since it ignores the results from the previous chapter because mercury is also a metal. Please comment.

I attended Marek Tuhý's presentations at local and international conferences where he successfully passed challenges of questions and discussions with the scientific community. That, supported by the dissertation thesis, served for myself as a proof of international recognition of the presented research. Without any doubts, submitted papers by applicant Marek Tuhý were his original contributions and extended the general knowledge on effects of wildfires. This thesis as a whole indeed demonstrated the abilities of applicant to produce, process and present scientific data. Thus it is my pleasure to recommend this dissertation thesis for graduation in a doctoral study program and award of the PhD degree.

In Prague, 19<sup>th</sup> September 2021

Tomáš Navrátil

