

Comment on egusphere-2022-462

Anonymous Referee #1

Referee comment on "Magnetic fraction of the atmospheric dust in Kraków – physicochemical characteristics and possible environmental impact" by Jan M. Michalik et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-462-RC1>, 2022

General comments:

Michalik *et al.* studied magnetic fraction of atmospheric dust in Kraków, Poland, using a passive magnetic sampler. They used a wide selection of analytical methods and obtained reliable and interesting results, broadening the knowledge on magnetic particulate matter in urban environments. They observed magnetic particles of various sizes (from larger than 100 μm down to smaller than 100 nm), morphologies and compositions (with a wide variety of metals associated with the magnetic particles). Given the potential health impact of airborne magnetic particles (almost always also associated with various potentially toxic metals), the identification and thorough characterization of magnetic urban particulate matter is of importance.

Specific comments:

1) More details in the Method section would be valuable, e.g.:

1a) [Lines 58-63] More info re sampling site. Is it next to a busy street? How far from the street curb? How busy this street is? How many lanes? What is the traffic volume? Etc.

1b) [Lines 70-80] It is unclear how the samples were collected and dispersed in isopropanol. Was the PVC foil ultrasonicated in isopropanol? For how long?

1c) [Lines 82-88] What kind of powdered samples? Were they collected separately from these collected with magnets and PVC foil?

2) Some discussion on advantages and disadvantages of this kind of sampler would be interesting. There are obvious benefits of such a system (e.g. simplicity, low workload required, etc.) but also some drawbacks (e.g. very poor temporal resolution, dependence on the weather, etc.). From a practical side, how big is the system? How much material (mass? volume?) was collected in the 9 months of sampling? This kind of discussion would be interesting regarding the potential use of such passive sampler instead of 'active' vacuum-based PM₁₀/PM_{2.5} samplers.

3) [Lines 179-198] Interesting discussion on the sources of the magnetic particles. It is indeed challenging to unambiguously determine the source of these particles (it is most probably a mixture of several sources). High concentration of Cu and Zn in some of the particles might suggest the non-exhaust vehicle sources (brake- and tyre-wear). Was Ba analysed? Its presence would also suggest the brake-wear as the source.

3a) [Lines 199-205] Well, high concentrations of Fe oxides can be also derived from vehicular brake systems, as shown in several recent studies so it would be also worth considering this potential source as the concentrations of magnetite (and other Fe-rich minerals) in brake-wear PM can be even an order of magnitude higher than in emissions from industrial processes! Also, more details on the sampling site location would provide more information on this topic (cf. comment 1 on the Method section).

Technical comments:

4) [Lines 39-48] Worth mentioning ultrafine metal-rich PM found in the placenta tissues by Liu et al. (2021). **STOTEN** 751, 142235.
<https://doi.org/10.1016/j.scitotenv.2020.142235>.

5) [Line 50] There seems to be a comma missing before 'Dust'.

6) [Line 75] There seems to be a double space before 'Transmission'.

7) [Figures 3, 4 and 5] Scales on the EM images could be larger. It is (very) difficult to read them in the current size.

8) [Figures 3 and 4] It is difficult to read these elemental compositions in the figure captions. It would be maybe better to convert these data into tables, e.g. adjacent to the EM images...?

9) [Lines 179 – 198] This paragraph consists of a very interesting discussion on the sources of the magnetic particles. However, the beginning of the paragraph [lines 180-185] seems very wordy. I suggest to rephrase the first few lines into a much more concise information.

10) [Line 183] There seems to be a double space before 'Chemical'.

11) [Line 190] 'It is also possible to assume that irregular...' – very wordy phrase (also repeated several times in other places in the text). Maybe better to use 'It is possible that the irregular...' or just 'Possibly, the irregular...'?