

Interactive comment on “Imaging and quantification of the pore microstructure of gas shales using X-ray microtomography” by Mozhdeh Mehrabi et al.

Anonymous Referee #2

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This manuscript presents a study using micro-CT to characterize the pore structure in shale. Without finishing reading this manuscript, I have to reject it after reading Figure 3 because the segmented “pores” in this figure are either artificial cracks induced in sample retrieval or preparation, or layers of organic matter, or some low density features (that may or may not include pores). It just cannot be real pores. There are significant amount of literature focusing on pore characterization using SEM, FIB/SEM, nano-CT, or MICP, or nitrogen adsorption, and it is consensus that pores in shale matrix are mostly in sub-um scale, with small amount larger than 200-300 nm, if any. Instead, a substantial amount of pores are tens of nm to sub-nm-scale. The results and discussion based on the wrong interpretation of the micro-CT images are there-

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fore meaningless.

Specific comments:

Ln 19: “Unfortunately, these two methods destroy the samples”: the authors should realize that all methods destroy samples in some extent. Therefore, this is not a main reason for not using a specific technique.

Ln 27: “. . .but is unlikely to be due to both techniques not being able to measure pores smaller than about 900 nm.”: I don’t see the logic here. Micro-CT cannot measure < 1 μm in this study, at the same time, MICP can measure all pores connected through > 3 nm pore throats. This will naturally make the micro-CT porosity (if doable) smaller than MICP porosity. Instead, “displacement of kerogen by the high pressures. . .” is only a speculation without data support.

Ln 32: “major axis is up to 330 times bigger than the minor axis.”: As mentioned earlier, these cannot be pores.

Ln 120: “760 nm . . .is sufficient to image most pores in shale”: this is simply wrong. Most pores in shale is smaller than 100-200 nm, with a big amount of them smaller than 10 nm or smaller.

Ln 213, Figure 2. The resolution in Figure 2 is not 50 μm , 20 μm , and 5 μm for a, b, and c, respectively. They are the bar length. The actual resolution, for example, in Figure 2c would be nm-scale. The caption of this figure is therefore wrong and misleading.

Ln 229: “that most of the pore space is not well-represented in this figure due to the resolution of the figure rather than the resolution of the data.”: this statement indicates that the authors realized the resolution is not adequate. But unfortunately they continued to build the study based on something wrong. The statement of “due to resolution of the figure rather than the resolution of the data” is difficult to understand. What is the difference between resolution of the figure and the resolution of the data?

Typos:

Although I only read the first few pages, I found several typos:

Ln 7: “institutue” → institute

Ln 21: “porisimetry” → porosimetry

Ln 88: “step” → steep?

Ln 247: “discrepancyis” → discrepancy is

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