Response to the 1st anonymous reviewer:

In this study, the authors report electrical conductivity of anhydrous and hydrous gabbroic melt under high temperature and high pressure: Implications for the high conductivity anomalies in the region of mid–ocean ridge, and I found that it is one interesting work. It is first time that the functional model of the electrical conductivity on gabbroic melt was constructed under conditions of 873–1373 K, 1.0–3.0 GPa and water content ranges of 0–8.32 wt%. Their results indicate that the electrical conductivity of gabbroic melts can be employed to reasonably interpret the high conductivity anomalies in the Mohns ridge of the Arctic Ocean. The paper contains the unique data of the electrical conductivities of anhydrous and hydrous gabbroic melts.

As a whole, high-pressure electrical conductivity experimental measurements seem to have been designed and executed very consciously. The manuscript is well written, extremely well organized, is easy to read and well-illustrated. The data support the conclusion of this study. The data can potentially provide a new model to deeply explore the origin of the high conductivity anomalies in the Mohns ridge of the Arctic Ocean. I have two recommendations, listed below, but none of them are severe, thus I would strongly recommend its publication in Solid Earth.

Thanks for your valuable and constructive comments and advisements, which are greatly helping us to improve and enhance our manuscript. In the revised manuscript, all of these above-mentioned issues from the 1st anonymous reviewers have already been supplemented and modified, accordingly. Each correspondent revised counterpart is detailedly described sentence by sentence, as follows.

1. The vacuum FT–IR spectroscopy measurements were performed on the five different regions of transparent sample surfaces and made an average value. Please provide the corresponding error bar of each water contents for the initial and recovered gabbroic melt samples in Table 2.

Thanks for your very conscientious comments. According to your valuable advisement, the corresponding error bar of each water content for the initial and recovered gabbroic melt samples have been listed in Table 2.

2. The low frequency signals in the impedance spectra of gabbroic melts are not completely represent the sole electric conduction response for the polarization process at sample–electrode interface. Please clarify it clearly for the audiences.

Thanks for your valuable and professional comments and suggestions. Just as pointed out by Tyburczy and Roberts (1990), Dai and Karato (2009a, 2009b) and Dai et al. (2012, 2013), in case of single crystal minerals, the impedance spectra of sample within the high-frequency range from ~10^2–10^3 Hz to 10^6 Hz can be interpreted as the bulk conduction mechanism (i.e. grain interior), and whereas, the impedance spectra of sample within the low-frequency range from 10^0 Hz to ~10^2–10^3 Hz can be attributed to the sample–electrode interface polarization. As detailedly illustrated by Dai et al. (2008, 2014, 2016) and Dai and Karato (2009c, 2020), in case of polycrystalline aggregates or natural rock, the impedance spectra of sample within the high-frequency range from ~10^2–10^3 Hz to 10^6 Hz can be interpreted as the bulk conduction mechanism (i.e. grain interior), and whereas, the impedance spectra of sample within the low-frequency range from 10^0 Hz to ~10^2–10^3 Hz can be attributed to the grain boundary conduction mechanism or the polarization process at sample–electrode interface. In the present studies, I absolutely agreed with your viewpoint that the low frequency signals in the impedance spectra of gabbroic melts are not completely represent the sole electric conduction response for the polarization process at sample–electrode interface. In the revised manuscript, we have already supplemented it "The impedance spectra of gabbroic melts within the high-frequency range from ~10^2–10^3 Hz to 10^6 Hz can be interpreted as the bulk conduction mechanism (i.e. grain interior), and whereas, the impedance spectra of sample within the low-frequency range from 10^0 Hz to ~10^2–10^3 Hz represent the grain boundary conduction mechanism or the polarization process at sample–electrode interface (Tyburczy and Roberts (1990), Dai et al. (2008, 2012, 2013, 2014, 2016); Dai and Karato (2009a, b, c, 2020)).

In conclusion, we thank the editor of Professor Yang Chu from Institute of Geology and Geophysics, Chinese Academy of Sciences, and two anonymous reviewers for their very constructive and enlightened comments and suggestions in the reviewing process, which helped us greatly in improving the manuscript.