CONCLUSION

of the Dissertation Council on Chemistry and Engineering at Al-Farabi Kazakh National University

on the dissertation work of Mr. Anas Houbi on the topic "Creating and studying new composite materials for microwave absorption in the range of 8.8-12 GHz", submitted for the degree of Doctor of Philosophy (PhD) under the educational program "8D07104 - Chemical Technology of Inorganic Substances"

Based on the results of the defense and secret ballot on February 22, 2023, the dissertation council decided to send for revision the dissertation of Mr. Anas Houbi on the topic "Creating and studying new composite materials for microwave absorption in the range of 8.8-12 GHz", submitted for the degree of Doctor of Philosophy (PhD) under the educational program "8D07104 - Chemical Technology of Inorganic Substances". When revising the dissertation, the following comments should be addressed:

1) Statistics should be properly described in the dissertation. It is unclear how many times experiments were repeated (or how many experimental samples were prepared for each value of an independent variable), how exactly mean values and standard deviations were determined. Values of standard deviations should be provided.

2) There are too many significant figures in many reported values. They

should be rounded according to their uncertainties or standard deviations.

3) Dissertation is not properly formatted. Spaces are missing between tables and text, figures and text. Formatting should be conducted using a single style.

4) Description of the practical significance of the work in introduction and abstract of the thesis should be improved. Potential application of the obtained results should be presented.

5) References (citations) to the borrowed figures are not provided.

6) Quality of English should be improved in the dissertation.

7) The object(s) of the research must be concrete, such as $PANI/Ni^{3+}_{0.25}Ni^{2+}_{0.375}Zn^{2+}_{0.25}Fe_2O_4$ and $PANI/BaNiZnFe_{16}O_{27}$ composites.

8) Details of the particle size analysis conducted using SEM images and ImageJ are not provided in the dissertation.

9) Novelty is not shown clearly. There are many previous studies on EMA properties of these materials and their combination.

10) It is unclear how dielectric and magnetic fillers enhance EM wave absorption performance. Please explain it with polarization, dipole movement, conductance loss, and loss tangent.

11) The research results are dispersed throughout the dissertation in a very peculiar way: X-ray diffraction analyses, surface morphology, Fourier IR studies and microwave absorbing properties of all materials are divided into headings. In order to grasp the relationship between X-ray diffraction analysis of IR studies with the microwave absorbing properties of nanocomposite materials, it is necessary to return to the beginning of the dissertation.

- 12) Conclusion is incomplete. The information on research methods, which is available in section 2, is repeated in conclusion.
- 13) The description of the FTIR spectra of $Ni_{0.5}Zn_{0.5}Fe_2O_4$ at various temperatures (650, 800, and 950°C) and in various PVA aqueous solutions (1%, 4%, and 6%) is not available in the dissertation.
- 14) The reasons for the synergistic effect of magnetic and dielectric losses on the degree of loading are not specified.

The revised dissertation with responses to provided comments should be submitted to the dissertation council within a three-month period, which can be extended for no more than 3 (three) months. The decision to extend the completion period is made by the dissertation council on the basis of the application of the doctoral student. If the revised dissertation with responses to provided comments is not submitted in a due time, the dissertation will be sent for a secondary defense.

Chairman of the Dissertation Council, Candidate of Chem.Sc., Professor

B.N. Kenessov

Scientific Secretary of the Dissertation Council, Doctor of Chem.Sc., Professor

Duf

S.M. Tazhibayeva

