Dear Editor Icy Liu and Reviewers:

Thank you for your letter and for the reviewers’ comments concerning our manuscript entitled “Study on the Preparation and Performance of Alkali-activated Coal Gangue-Slag Cementitious Materials” (Manuscript number: materials-533306). Those comments are all valuable and very helpful for revising and improving our paper, as well as the important guiding significance to our researches. We have studied comments carefully and have made correction which we hope meet with approval. Revised portion are marked in red in the manuscript. The main corrections in the manuscript and the responds to the reviewer’s comments are as following:

Responds to the reviewer’s comments:

Reviewer #3:

Special thanks to you for your good comments, and your affirmation of the manuscript. Thank you for your time and recognition.

1. Response to comment: A proofreading needs to be done by a native.

Response: Thank you for your suggestion. We revised and improved the abstract, introduction, experiment, result and discussion parts of the manuscript respectively. In the introduction section, we highlight the research background and significance, and supplement the references related to the research content of this paper. We have supplemented the experimental process and curing conditions, and we have also proofread and polished the conclusion, making the study of this manuscript more
meaningful. The red font in the manuscript is the revised content. The current submitted manuscript has been carefully revised and proofread. The proofread manuscript is complete and substantial, and its content and framework are complete.

2. **Response to comment:** Check references 5 and 17! to be sure that coal gangue has been mentioned in the paper.

**Response:** Thank you for your suggestion. I carefully proofread the manuscript content and references. In the introduction, I added the research background and the current research status of alkali-activated coal gangue, which made the article more substantial and meaningful. The corresponding changes are marked in red in the introduction.

3. **Response to comment:** The authors could cite following papers:


**Response:** Thank you for your suggestion, and thanks for the references recommended by the reviewer. I read these references carefully. The author studied the mechanical properties, water absorption, drying shrinkage and carbon sequestration potential of alkali-activated materials, and studied the hydration and strength development under different curing regimes and raw material dosage conditions. The study was very meaningful and helpful to me. The author's review on the drying shrinkage of alkali-activated cementitious materials has guided my subsequent research direction. I have
carried out the drying shrinkage of AACGS mortar, and have also searched for appropriate methods to inhibit the drying shrinkage. The current status of academic manuscript is "under review", and I am looking forward to having face-to-face communication with the author. I have cited the references recommended by the reviewer in my manuscript to enrich the content of my manuscript.

4. **Response to comment:** in the introduction the authors mentioned that solid activator can works better than liquid why they did not use powder in their mixes? Use this reference (https://www.sciencedirect.com/science/article/pii/S0008884617306877)

**Response:** Thank you for your suggestion. What I mentioned in the introduction is that the compressive strength of the polymer excited by the dry powder activator is higher than that of the polymer excited by the sodium hydroxide solution. The test process of the material excited by the dry powder activator is to mix the dry powder activator with the reaction raw materials and add water to stir. I'm talking about dry powder activators and NaOH activators. NaOH activators are not solid activators. We are very sorry for bringing the difficulties to reviewers due to our writing. Thank you for your reference. This reference is very meaningful and I have quoted it in my manuscript. The corresponding revisions are marked in red in the manuscript.

5. **Response to comment:** Presented resulted in figures 2a, if gouge is the main binder, mixture 0% should be changed to 100% and the content of GGBFS slag should reduce this amount. For instance, the first columns are related to 100% gauge instead of 0%, the second series will be changed to 90%, and this reduces up to 50%.
Response: Thank you for your suggestion. For this problem, I understand it in this way. The most important influencing factor studied in this manuscript is the slag content. In the manuscript, Fig. 2(a) describes the influence of the slag content on the compressive strength, and the variable is the slag content. According to the opinions of reviewers, if I change the abscissa to the variation amount of coal gangue (100%, 90%, 80%, 70%, 60% and 50%), as shown in the figure below, the variable is the variation amount of coal gangue, which is different from the variable expressed in the manuscript.

6. Response to comment: Please explain why you have selected the mix with 30% gouge slag while even 50% has high strength (Figure 2b and 2c)?

Response: Thank you for your question. Based on the current application of calcined coal gangue in alkali activated materials, the research group studies two major directions: The first is the study on alkali-activated coal gangue by various factors and the in-depth discussion on the reaction mechanism of alkali-activated coal gangue,
which has been published in the journal of Construction and Building Materials (Title: Preparation and characterization of coal gangue geopolymers); The second is based on the research results of alkali-excited coal gangue, taking slag as a calcium source and reinforcing alkali-activated coal gangue, the related research is the research content of this manuscript. There are two reasons for selecting 30% slag:

(1) The original intention of the research group is to make use of coal gangue in large quantities, adding slag can increase the compressive strength of alkali-activated coal gangue, and change the original silica-aluminum material into calcium-silica-aluminum material. Under the condition of achieving the test results, the lower the content of slag, the better.

(2) With the increase of NH molar concentration, the geological polymerization reaction process of raw materials will be accelerated and the condensation rate will be accelerated. In order to compare the experimental study with the previous study (NH molar concentration is 8M, 10M, 12M, 14M and 16M), slag content of 30% is selected for the experimental study. The research group tested the setting time in subsequent mortar studies, and the higher the slag content, the lower the required alkali concentration. High alkali concentration may lead to the phenomenon of rapid coagulation or short coagulation time of AACGS cementitious materials.

7. Response to comment: In figure 4, how non-evaporated water was measured?
Response: We adopted the combustion method to measure non-evaporable water content of the AACGS specimens. A certain amount of dry specimens was weighed and placed at 900°C for 3 hours. The mass loss was used as the non-evaporable water content of AACGS specimens. The non-evaporable water content was calculated in accordance with Formula 1.

\[ W_{ne} = \frac{(W_0 - W_1)}{W_0} \] (1)

Where: \( W_0 \)—mass of specimen heated at 105°C (g),

\( W_1 \)—mass of specimen heated at 900°C (g).

Thank you very much for your letter and advice on our manuscript. We quite appreciate your favorite consideration and the reviewer’s insightful comments. We tried our best to improve the manuscript and made a little changes in the manuscript. These changes will not influence the content and framework of the manuscript. We did list the changes and marked in red in revised manuscript (except grammatical and English language). We appreciate for Editor Icy Liu and Reviewers warm work earnestly, and hope that the correction will meet with approval.

Once again, thank you very much for your comments and suggestions. We hope that the revision is acceptable and look forward to hearing from you soon.

With best wishes,

Ma Hongqiang, Zhu Hongguang*, Yi Cheng, Fan Jingchong, Chen Hongyu, Xu Xiaonan and Wang Tao