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Article

Orthogonal Experimental Study on the Construction of a Similar Material Proportional Model for Simulated Coal Seam Sampling

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Abstract: The development of similar materials is crucial for conducting simulated coal seam sampling experiments. These materials must comprehensively consider the similarity of mechanical properties with raw coal. To ensure a high degree of similarity between the simulated coal seam similar material and raw coal, cement and coal powder were selected as the main influencing factors. This study employed sensitivity analysis and analysis of variance methods to investigate the impact of various factors on the compressive strength, elastic modulus, Poisson's ratio, and density of comparable materials. The influence of moisture content on the compressive strength and elastic modulus of these materials was also analyzed, as well as the effect of cement and coal powder on moisture content. The results showed that cement was the main controlling factor for the mechanical properties of similar materials. Moreover, the variation of tensile strength and elastic modulus of similar materials in response to the moisture content can be divided into three distinct stages. Based on the influence law, the ratio formula of coal powder and cement for the strength and moisture content of similar materials was obtained, and a proportional model for simulated coal seam sampling similar materials was constructed. The approximate ranges of various parameters that can be achieved by this model are as follows: compressive strength of 1–11.4 MPa, elastic modulus of 0.27–3.62 GPa, Poisson's ratio of 0.229–0.357, and density of 1.044–1.341 g·cm⁻³. The error in mechanical parameters for this model has been verified to be within 20%. Finally, similar materials were created for simulated coal seam sampling by employing an appropriate ratio. A self-developed drilling test platform was utilized to successfully conduct an experiment, further demonstrating the reliability of the proportional model.

Keywords: coal seam sampling experiment; similar materials; moisture content; compressive strength; proportional model



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1. Introduction

Gas content serves as the crucial fundamental parameter for gas management and coal-bed methane development. Accurate determination of gas content forms the basis for gas disaster prevention in coal mines, while the development of precise sampling technology is the key to accurate determination of coal seam gas content. However, traditional sampling methods used in most coal mines often result in significant errors between the measurement results and the actual situation, leading to the “low content prominence” in some mines. In response to this situation, a loss-free borehole in-situ sampling device has been developed to achieve high sampling efficiency and avoid the loss of coal gas samples. Laboratory simulation experiments are the most effective for the verification of the sampling effect. The study of similar material sampling is a critical basis for simulations, as the similarity between the materials and the raw coal determines the accuracy of the simulated coal seam sampling.

Similar material simulation has been widely employed to study the mechanical properties of rock masses since it started early and has been extensively researched by experts

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SAP Certified Associate - Backend Developer - SAP Cloud Application Programming Model Sample Questions (Q71-Q76):

NEW QUESTION # 71

During application development, what are some principles of dealing with application errors? Note: There are 2 to choose.

- A. Log unexpected errors
- B. Use as many try/catch blocks as possible
- C. Use try/catch blocks sparingly
- D. Hide errors and continue silently

Answer: B,C

NEW QUESTION # 72

Which of the following are added to your CAP project when you run the "cds add pipeline" command in an SAP Business Application Studio terminal? Note: There are 2 correct answers to this question.

- A. A file named Jenkinsfile
- B. A pipeline folder with a config.yml file
- C. A pipeline folder with a manifest.yml file
- D. A Jenkins folder with a manifest.yml file

Answer: A,B

NEW QUESTION # 73

During application development, what are some principles of dealing with application errors? Note: There are 2 correct answers to this question.

- A. Use as many try/catch blocks as possible
- B. Use try/catch blocks sparingly
- C. Hide errors and continue silently
- D. Log unexpected errors

Answer: B,D

NEW QUESTION # 74

What feature of the pre-built content packages in SAP Build Process Automation increases the speed of development? Note: There are 2 correct answers to this question.

- A. Enhanced user interface
- B. Predetermined decisions
- C. Plug-and-play availability
- D. Templated automations

Answer: C,D

NEW QUESTION # 75

You use the Cloud MTA Build Tool to create an MTA archive (.mtar) from your project source. What command must you run to do this in one step?

- A. mbt init
- B. mbt make
- C. mbt build

Answer: C

NEW QUESTION # 76

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