

Study on Lateral compression deformation and constitutive relation of filling body

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Abstract: In order to study the mechanical behavior of the filling body under compression under deep high stress, Select concentration 70%, Gray sand ratio 1:10, Curing age respectively 14d, 28D, 56d Confined consolidation experiments under different stress loading levels of classified tailings cemented filling body, The results show that: The axial compression gradually increases with the increase of stress loading level., Logarithmic function relationship with axial stress; The relationship between axial strain and stress is quadratic function.

Keywords: Filling body; Confined Consolidation; Constitutive Relation; Deformation

With the increasingly high demand of environmental protection and sustainable development in China, Most mines in China are transformed from empty field mining to empty field subsequent filling mining.^[1-9] The key point of filling mining is whether the filling body can meet the requirements in the stope environment?, At present, the research on the strength and damage of filling body has become a hot spot in this field.^[8-10] Filling body is different from traditional concrete material., First, the cement content of the filling body is less and it is easy to produce segregation., Its strength is often lower. In recent years, A lot of researches have been done on the failure mechanism and mechanical properties of the filling body., Significant progress has been made from both the traditional Macroscopic View and the microscopic view of scanning electron microscope.^[11-25] In the actual stope Environment, Because of the existence of upper and lower plate surrounding rock and overlying rock mass, Special stress conditions of backfill under confined compression, Research on Stress Analysis of the filling body in the stope under confined compression, The current research is still insufficient. It is of great significance to study the Deformation Characteristics and constitutive relation of the filling body under confined compression for explaining the Long-term Service mechanics mechanism of the filling body and the mechanical mechanism of the filling body and surrounding rock.. In this paper, through the simulation of stope filling, Confined compression consolidation tests of filling body under different axial stress levels and curing ages were carried out., It will provide theoretical basis for Filling Design of large-scale filling body and filling body Design of Three-under filling mining in deep mining., Has Major of engineering significance.

1. Test Programme

Test using the try block for classification tailings filling slurry in standard maintenance conditions under production water cement ratio 1:10, Quality concentration 70%, Respectively Maintenance 14d, 28D, 56d, Each maintenance age preparation 3A sample In 9A sample. In order to achieve filling body in side limit conditions under the compression Consolidation Test Try block abrasive 45 # Steel production of seamless steel cylinder (See figure 1), Cylinder Diame-

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ter80mm,Height180mm,Wall Thickness6

Try block in to provisions14d, 28D, 56dMaintenance age afterThe carry out corresponding of side limit conditions under the compression Consolidation Test.Test process inStep by step applied pressure loadIts load path: 4kN(0.8MPa)·8kN(1.6MPa)·16kN(3.2MPa)·32kN(6.4MPa)·64kN(12.8MPa)·128kN(25.5MPa).Consolidation pressure the most greatly128kN (25.5MPa)Is taking into account new town gold depth800 m,Its vertical should be force25.5MPa.

2. Side limit compression of radial displacement analysis

Due to45 #Steel production of seamless steel cylinder simulation side Limit ConditionsFrom Theory Angle AnalysisOnly seamless steel cylinder of Elastic ModulusETo infinite whenTo meet in theory of side limit compression

Shrinkage process in filling body under steel cylinder of confining pressure; P_3 For testing machine applied

Of axial pressure; E , For filling body try block of elastic modulus he bo $2\mu_2$

Due to filling body and cylinder between belongs to Surface Contact ProblemAvailable filling body and cylinder in Cylinder DiameterAThe of displacement sameThe:

From formula(7)In can seeWhen E_1 Far greater E_2 An arcane D_A The value will be infinite approach in0,Meet theory of side limit compression conditions.ButIn experimental process inDue to the Axial CompressionFilling body of Elastic Modulus E_2 Is with the axis pressure of increase gradually increase.In axial pressure P_3 The applied process inSteel Cylinder lateral aspect of the paste Strain GaugeBy strain gauge can get compression process in $P = 2P_3$ The $\lambda = 2$,Will abrasive parameters into the formula() 7/Get cylinder of radial displacement D_A And load stress of relationship(See figure3).

From figure3Can seeRadial displacement D_A And load stress between was linear relationshipWhen load should be force25.5MPaAn arcaneRadial displacement D_A For0.24mm.0.24mmOf displacement relative to filling body deformationBasic can ignore filling body in compression process in radial displacementSoWhen maximum side limit consolidation should be force25MPaAn arcaneCompletely can will cylinder compression test simplified for side limit compression test.

3. Side limit consolidation of Deformation Mechanism Research

3.1 Axial Compression Change Law

The different maintenance age of filling body sample the side limit compression testEach maintenance age repeat3TimesTake average.Figure4For test device.The test of different age filling body of compression of see table1.

Table1 Different Load Stress Under filling try block compression

With the axial stress of increaseAxial Compression Deformation also with increase.The different maintenance age of filling body of compression of with axial stress of change law the regression Fitting AnalysisAs shown in figure5Shown in.In

Confined consolidation stress of filling body at different ages-Strain Regression Equation2.Filling body Stress-Strain curve regression significantly,High Accuracy,Therefore, the stress-strain curve fitting can well describe the mechanical characteristics of the consolidation under the constraint condition of the filling body..

4. Of on

(1)Radial displacement when stress D_A And load stress between was linear relationshipWhen load should be force25.5MPaAn arcaneRadial displacement D_A For0.24mm. 0.24mmOf displacement relative to filling body deformationBasic can ignore filling body in compression process in radial displacementSoWhen maximum side limit consolidation should be force25MPaAn arcaneCompletely can will cylinder compression test simplified for side limit compression test;

(2)The the age respectively14d, 28D, 56dOf a series of filling try block of side height limit stress Consolidation TestGet the different maintenance age filling body of compression Law.The axial compression of with the stress load

level of improve gradually increase And axial stress present logarithmic function relationship;

(3)The different age filling side limit consolidation process of stress-Strain Curve Fitting The axial strain and stress between present quadratic function relationship.

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