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Study on the Cyclonic Separation Mechanism of Flotation

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Study on the Cyclonic Separation Mechanism of Flotation

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Young college students are the hope of our country and nation. The historical experience shows that the value education problem for the younger generation cannot be neglected at any time and in any environment. Only through the strengthening of core socialist value belief of the youth, especially young college students, the great mission of achievement of great rejuvenation of the Chinese nation will have reliable backup forces.

Cyclonic static micro-bubble flotation is a new column separation method and device with China self-owned intellectual property. The successful application of this equipment in coal preparation along with its special cyclonic field structure has laid a solid base for the further application of column flotation in mineral processing.

Keywords: flotation; cyclonic separation; separation mechanism; flotation kinetics; mineral separation

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1 Introduction

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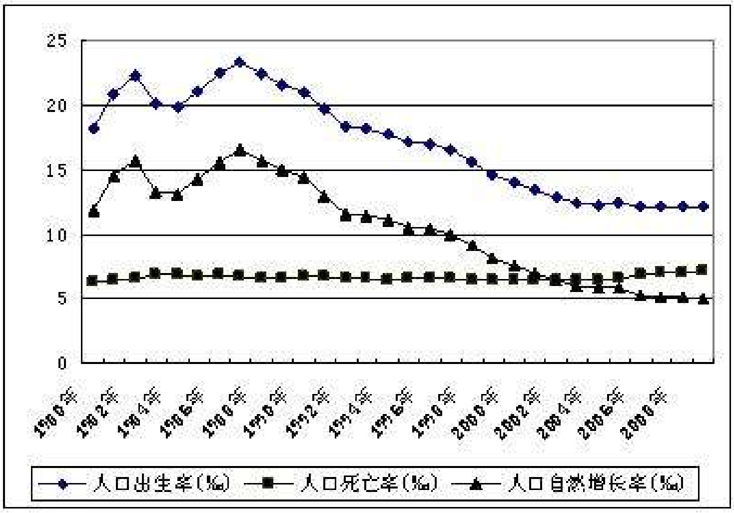

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2 Template Usage Guide

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$$\hat{\mathbf{y}}=\mathrm{argmax}_y\ \mathcal{D}_\vartheta(\mathcal{F}_\theta(\mathbf{X}_\sigma)). \tag{2-2}$$

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$$2\,H_2 + O_2 \xrightarrow{\text{□□}} 2\,H_2O$$
$$CH_4 + 2\,O_2 \xrightarrow{\text{FIRE}} CO_2 + 2\,H_2O$$

2.7 □□□□Floats□

2.7.1 □

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Data: this text
Result: some text
$x := x_0$;
while $x < 100$ **do**
  $x := y^2$;
  if $x > a$ **then**
    $y := y - 1$;
    $c := 10290$;
  else
    $y := y/2$;
  end
end

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3 Conclusion

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[1] ACHARYA B S, KHAREL G. Acid mine drainage from coal mining in the United States–An overview[J]. Journal of Hydrology, 2020, 588: 125061.

[2] BETZ M R, PARTRIDGE M D, FARREN M, et al. Coal mining, economic development, and the natural resources curse[J]. Energy Economics, 2015, 50: 105-116.

[3] LI X, CAO Z, XU Y. Characteristics and trends of coal mine safety development[J]. Energy Sources, Part A: Recovery, Utilization, and Environmental Effects, 2021: 1-19.

[4] MOHUTSIWA M, MUSINGWINI C. Parametric estimation of capital costs for establishing a coal mine: South Africa case study[J]. Journal of the Southern African Institute of Mining and Metallurgy, 2015, 115(8): 789-797.

[5] XIE H P, ZHOU H W, XUE D J, et al. Research and consideration on deep coal mining and critical mining depth[J]. Journal of China Coal Society, 2012, 37(4): 535-542.

[6] □□□□□□□□□□□□□□□. □□□□□□□□□□□□□□□□□□□□□□□□□□[M]. □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□, 2012.

[7] YOUNGER P L. Environmental impacts of coal mining and associated wastes: a geochemical perspective[J]. Geological Society, London, Special Publications, 2004, 236(1): 169-209.

[8] □□□, □□□, □□□. □□□□□□□□□□□□□□□□□□□□□□□□□□□□[J]. □□□□, 2014, 26(2): 3.

[9] □□□, □□□, □□□. 2025 □□□□□□□□□□□□□□□□□[J]. □□□□, 2019, 44(07): 1949-1960.

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Imports System.Math
Imports System.Drawing
Public Class Form1

    Private Sub Form1_Load(ByVal sender As System.Object, ByVal e
        As System.EventArgs) Handles MyBase.Load
        With Grid1
            .Cols = 9
            .Rows = 40
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