

# IPRO 346

## Objective:

Choose and design a desulfurization method to conform with EPA regulations and economically remove sulfur from coal.

**EPA Standard:** 81% total sulfur removed  
**Our Design:** 86% of total sulfur removed

### Costing Basis:

554,400 tons of coal processed / year

### Buying Price:

\$29.00 / ton of coal

\$18.68 / ton of lime

### Sale Prices:

\$90.58 / ton of cleaned coal

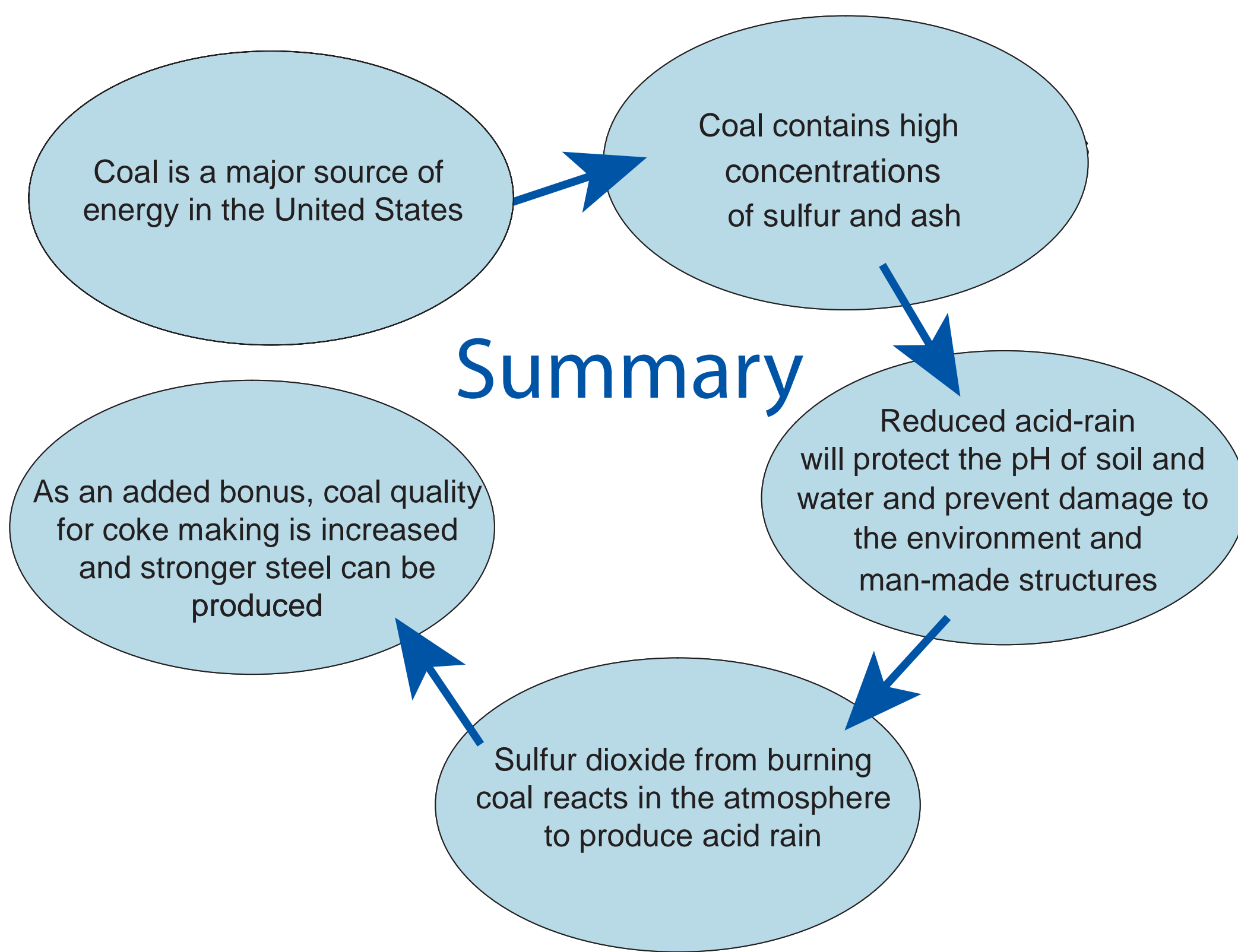
\$23.00 / ton of gypsum

### Profit:

Expenses: \$88/ton

Total Sales: \$98/ton

Net Profit = \$10/ton = \$5,167,879 / year



## Coal Composition

Sample Number	Ash %	Hydrogen %	Carbon %	Nitrogen %	Oxygen %	Sulfur %
Illinois #6 Average	11.68	5.04	65.475	1.34	12.655	3.805

## Sulfur Composition

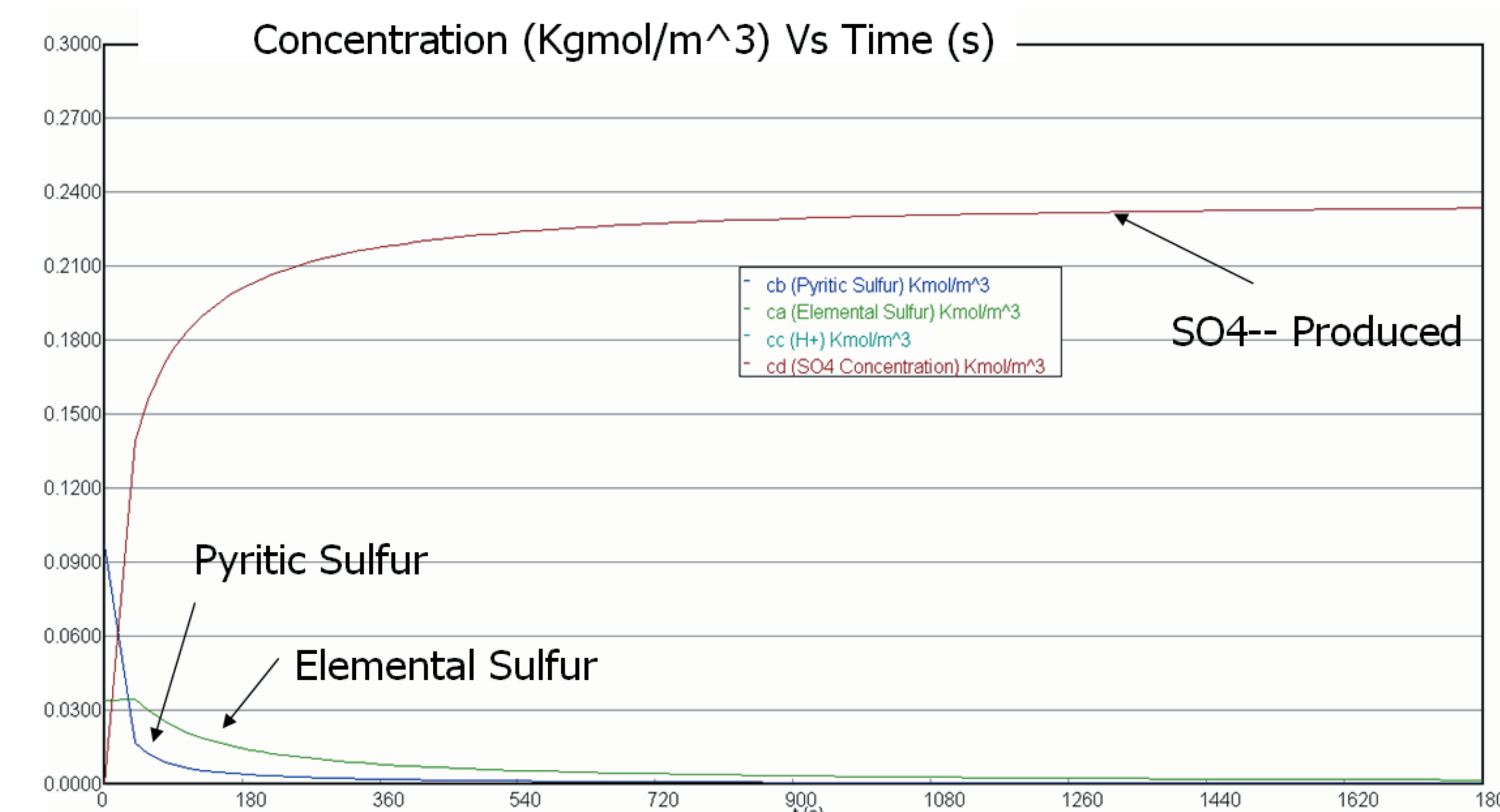
Sample	Elemental Sulfur %	Pyritic %	Organic %
Illinois #6 Average	0.175	1.825	1.805

## Fluidized Bed Calculation Results

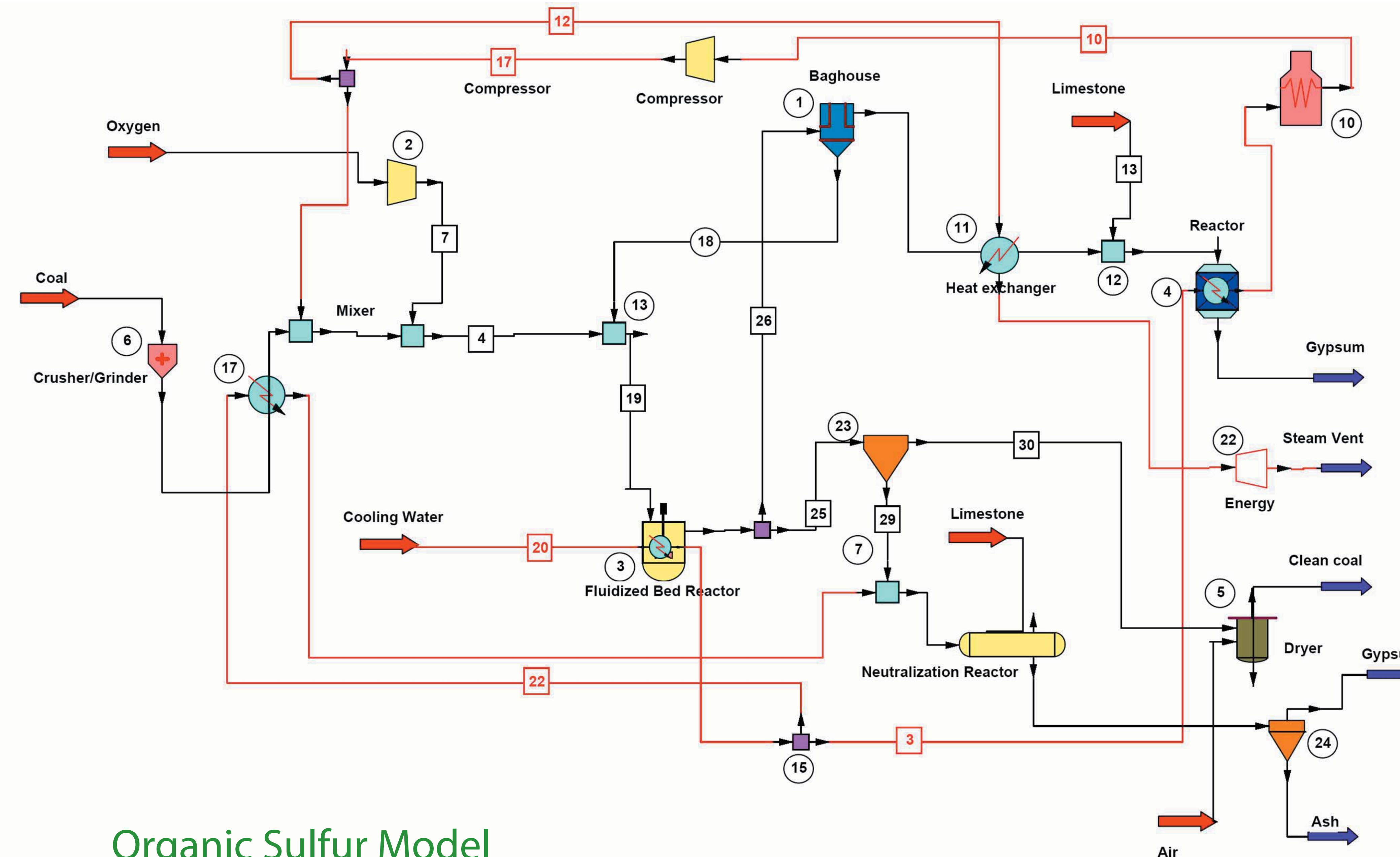
Variable	Initial value	Final value	
T (s)	0	1800	
Elemental Sulfur	Ca kmol/m <sup>3</sup>	0.034	0.001818
Pyritic Sulfur	Cb kmol/m <sup>3</sup>	0.0973	0.000436
H+	Cc kmol/m <sup>3</sup>	0	0.233877
SO4	Cd kmol/m <sup>3</sup>	0	0.233877

## Pyrite Concentration v. Time

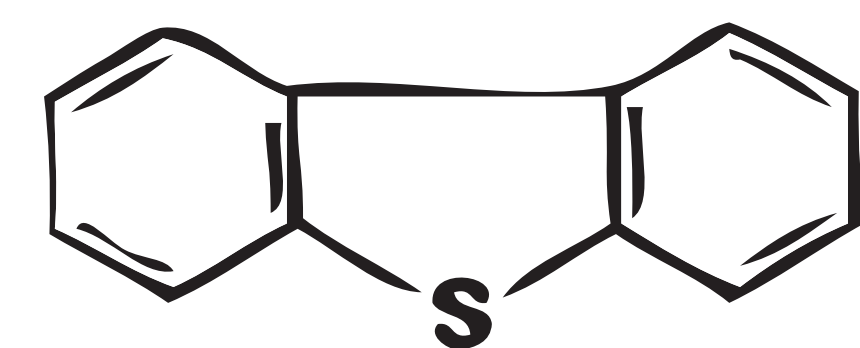
**99% Reduction of Pyrite.**



# Coal Desulfurization: Design of Coal Desulfurization Processes to Improve the Environment



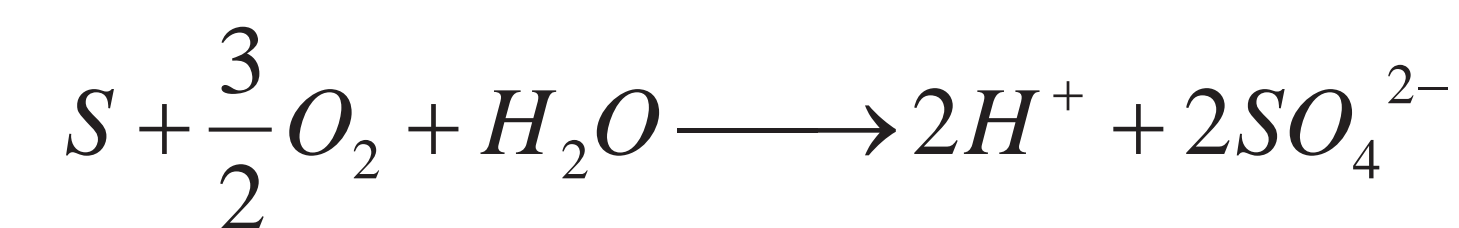
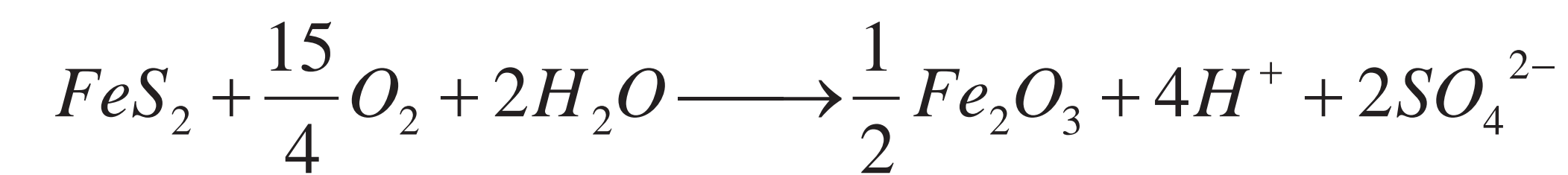
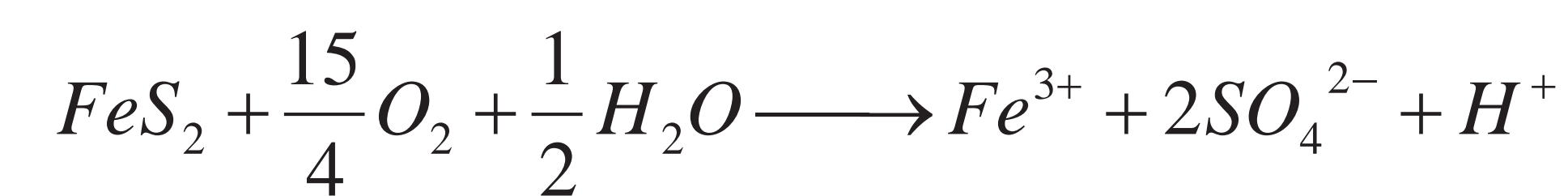
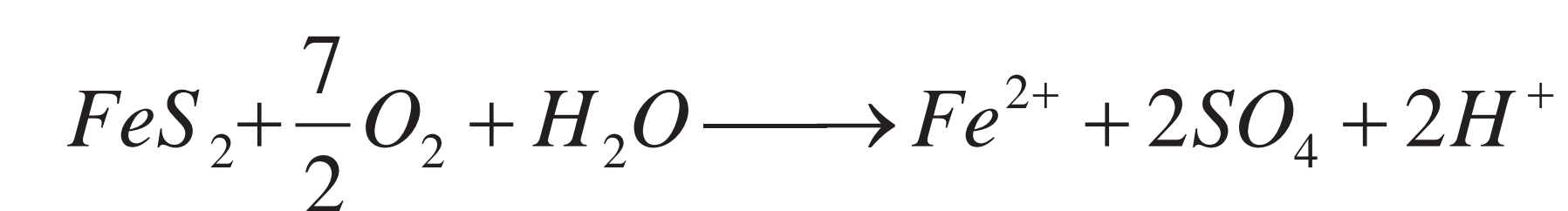
## Organic Sulfur Model



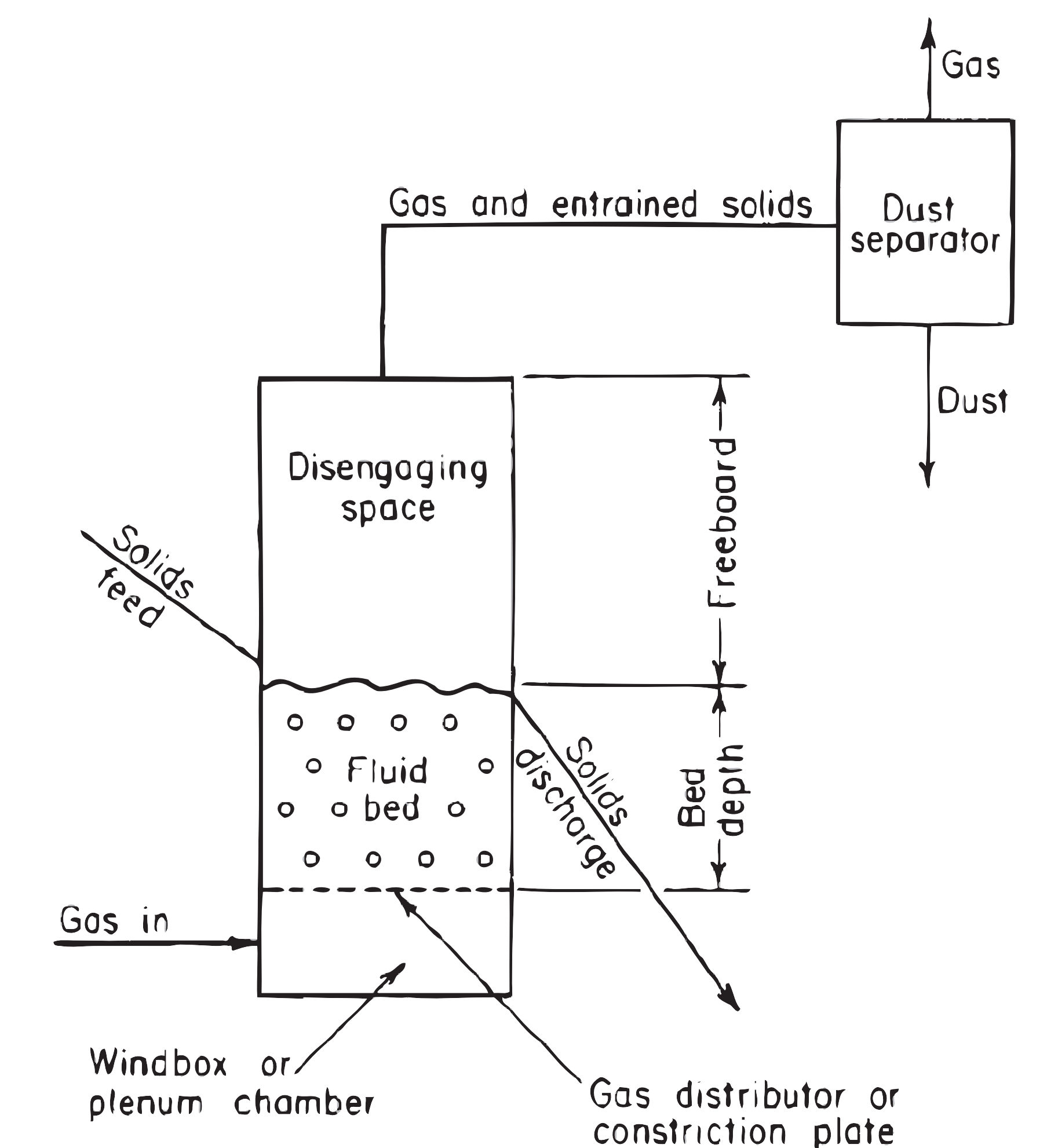
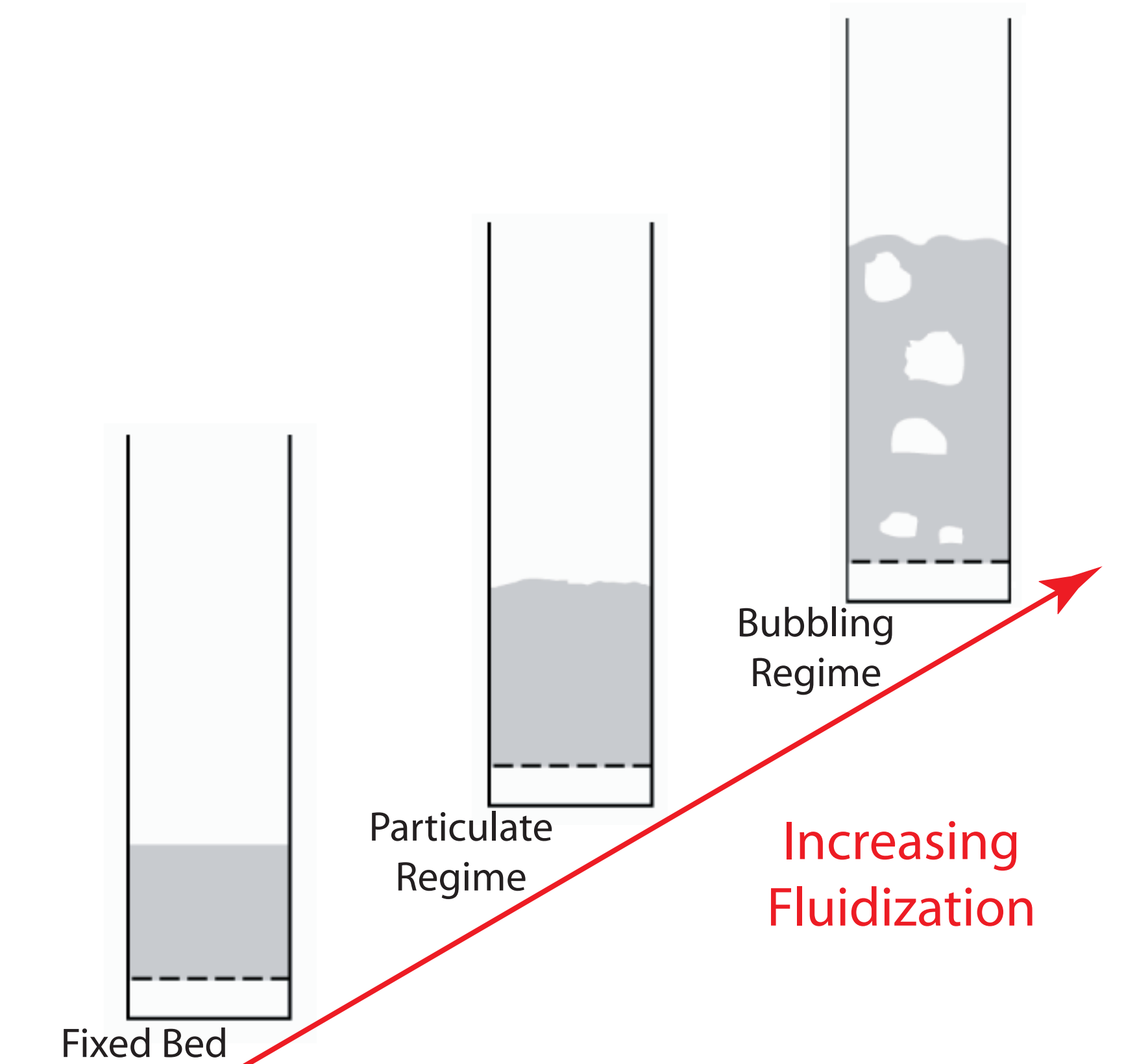
Thiophenic compounds such as this represent over 60% of the Organic Sulfur in Coal

**71.76% Organic Sulfur Removed.**

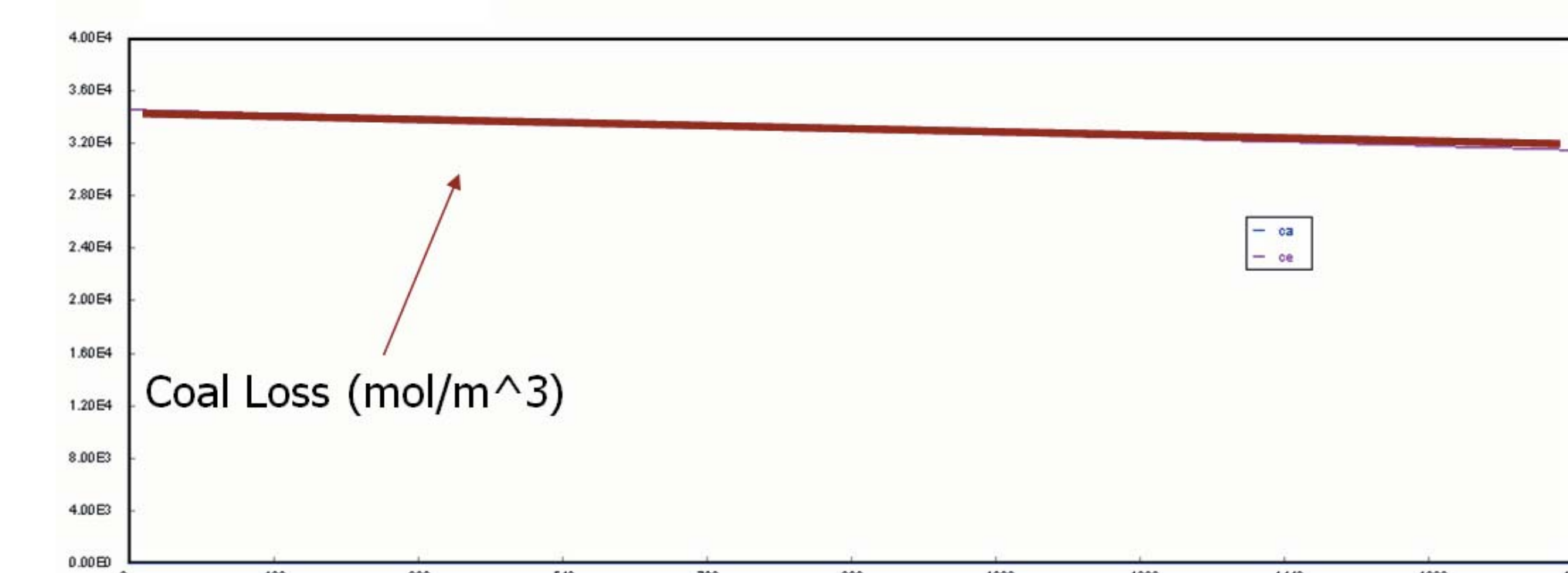
## Pyritic Sulfur Reactions



## How Fluidized Beds Work



## Carbon Loss v. Time



### Members:

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