**Table 1**

Properties of Coal Used for Simulation of the Case from Wang et al. [20]

|  |  |  |  |
| --- | --- | --- | --- |
| Property (units) | Symbol | Value | References |
| Density of coal |  | 1300 | Wang et al. |
| Density of air |  | 1.16 | Wang et al. |
| Specific heat of coal |  | 1990 | Wang et al. |
| Specific heat of air |  | 1000 | Wang et al. |
| Diffusion coefficient of |  |  | Schmal et al. |
| Porosity of pile |  | 0.46 | Wang et al. |
| Activation energy |  |  | Wang et al. |
| Frequency factor |  |  | Schmal et al. |
| Superficial air velocity |  |  | Schmal et al. |
| Thermal conductivity of pile |  | 0.12 | Schmal et al. |
| Heat of reaction |  |  | Schmal et al. |
| Heat of vaporization |  |  | Schmal et al. |
| Moisture content in coal |  |  | Wang et al. |

**Table 2**

**Properties of Dry and Moist Coal [29] Used (Standard Conditions)**

|  |  |  |  |
| --- | --- | --- | --- |
| Property (units) | Symbol | Dry coal | Moist coal |
| Density of coal |  | 1500 | 1500 |
| Density of air |  | 1.1 | 1.1 |
| Specific heat of coal |  | 1000 | 1000 |
| Specific heat of air |  | 1000 | 1000 |
| Diffusion coefficient of |  |  |  |
| Porosity of pile |  | 0.2 | 0.2 |
| Activation energy |  |  |  |
| Frequency factor |  |  |  |
| Universal gas constant |  | 8314 | 8314 |
| Superficial air velocity |  |  |  |
| Thermal conductivity of pile |  | 0.12 | 0.12 |
| Order of reaction of with coal |  | 1 | 0.7 |
| Heat of reaction |  |  |  |
| Heat of vaporization |  | - |  |
| Moisture content in coal |  | - |  |
| Weathering function |  | 1 | 1 |

|  |  |  |  |
| --- | --- | --- | --- |
| Property (units) | Symbol | Dry coal | Moist coal |
| Diffusion coefficient of O2 m2/s | Da | 2×10−5 | 2×10−5 |
| Porosity of pile | E | 0.2 | 0.2 |
| Superficial air velocity (m/s) | V | 0.6×10−5 | 0.6×10−5 |
| Weathering function | fc2 | 1 | 1 |
| Order of reaction of O2 with coal | n | 1 | 0.7 |

**Table 3**

List of Cases with Layers of Moist and Dry Coal Layers

|  |  |  |  |
| --- | --- | --- | --- |
| Case |  | Moisture content in the bottom, | Moisture content in the top, |
| A |  | 0 | 0 |
| B |  | 12 | 0 |
| C |  | 12 | 0 |
| D |  | 12 | 0 |
| E |  | 0 | 12 |
| F |  | 0 | 12 |
| G |  | 0 | 12 |
| H |  | 0 | 12 |

**Table 4**

Time Taken for Ignition and Ignition Location for Cases to (V and ) at Ambient Temperature of

|  |  |  |
| --- | --- | --- |
|  |  | Time (days) [Location (m)] |
| Case |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

Equation for low-temperature oxidation of coal

Equation for mass conservation of oxygen

Equation for conservation of heat

Equation for evaporation or condensation of water

Equation for mass conservation of moisture in coal

|  |  |
| --- | --- |
| Equation for low-temperature oxidation of coal | |
|  |  |
| Equation for mass conservation of oxygen | |
|  |  |
| Equation for conservation of heat | |
|  |  |
| Equation for evaporation or condensation of water | |
|  |  |
| Equation for mass conservation of moisture in coal | |
|  |  |

[1]

[2]

[3]

[1] H. Wang, Y. Liu, B. Shen, M. Ren, and Q. Shan, “Comparative Experimental Analysis on Coal Spontaneous Combustion,” *Energy Engineering*, vol. 119, no. 5, pp. 2031–2047, Jul. 2022, doi: 10.32604/EE.2022.020776.

[2] “A problem of plenty: Huge coal stock pile up may lead to fire this summer, ET EnergyWorld.” Accessed: Mar. 08, 2024. [Online]. Available: https://energy.economictimes.indiatimes.com/news/coal/a-problem-of-plenty-huge-coal-stock-pile-up-may-lead-to-fire-this-summer/51774774

[3] S. Muthu Kumaran, V. Raghavan, and A. S. Rangwala, “A Parametric Study of Spontaneous Ignition in Large Coal Stockpiles,” *Fire Technol*, vol. 56, no. 3, pp. 1013–1038, May 2020, doi: 10.1007/S10694-019-00917-6/METRICS.