Example of (inevitably coupled) mass transport and chemical kinetics

- Coal combustion: essential (for many years to come?) for electricity generation ⇒ minimize air pollution!

\[ O_2 \text{ needs to reach the particle surface for rxn to occur} \]
\[ O_2 \equiv A \]

\[ \frac{1}{S_{ex}} \frac{dN_A}{dt} = b k_g (C_{Ag} - C_{As}) = b R_{rxn} C_{As} \]

At steady state:
\[ A + bB \rightarrow \text{products} \]

Don't know \( C_{As} \) (difficult to measure interfacial/surface conc.)

\[ C_{As} = \frac{k_g C_{Ag}}{k_g + k_{rxn}} \quad \Rightarrow \quad \text{Rate} = \frac{b}{k_g + k_{rxn}} C_{Ag} \]

\[ T \propto \frac{1}{k} \text{; etc.} \]

* See also Section 27.2 in Atkins^\text{211},
\[ k = \frac{k_{rxn}}{k_{g} + k_{rxn}} \]