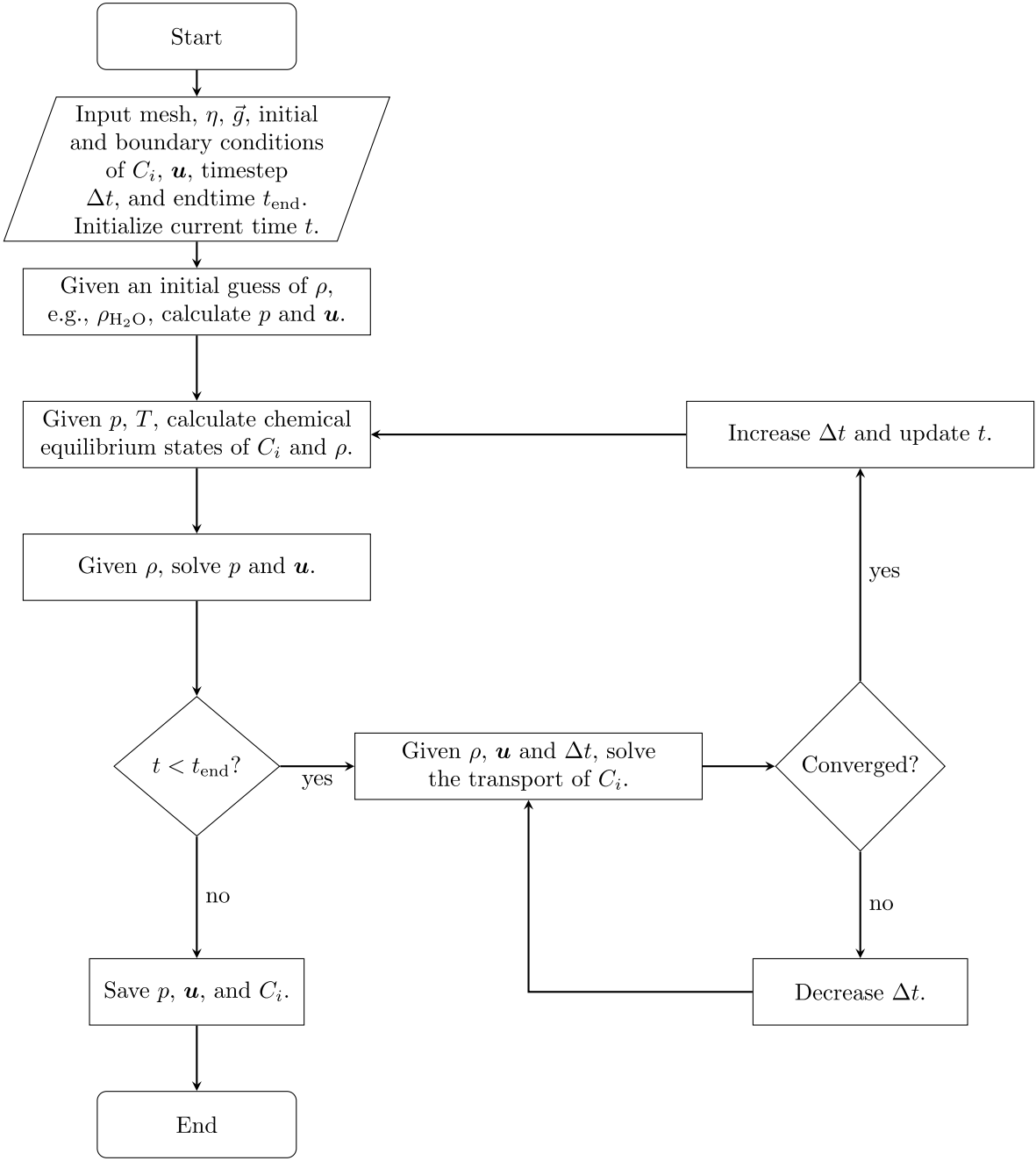
Start
Input mesh, $\eta$, $\vec{g}$, initial and boundary conditions of $C_i$, $\boldsymbol{u}$, timestep $\Delta t$, and endtime $t_{\mathrm{end}}$. Initialize current time $t$.
Given an initial guess of $\rho$, e.g., $\rho_{\mathrm{H_2O}}$, calculate $p$ and $\boldsymbol{u}$.
Given $p$, $T$, calculate chemical equilibrium states of $C_i$ and $\rho$.
Increase $\Delta t$ and update $t$.
Given $\rho$, solve $p$ and $\boldsymbol{u}$.
yes
$t < t_{\mathrm{end}}$?
yes
Given $\rho$, $\boldsymbol{u}$ and $\Delta t$, solve the transport of $C_i$.
Converged?
no
no
Save $p$, $\boldsymbol{u}$, and $C_i$.
Decrease $\Delta t$.
End