

DIFFUSION ACROSS BARRIERS: TWO IMPORTANT PARAMETERS

DIFFUSION ACROSS BARRIERS: 2 PARAMETERS

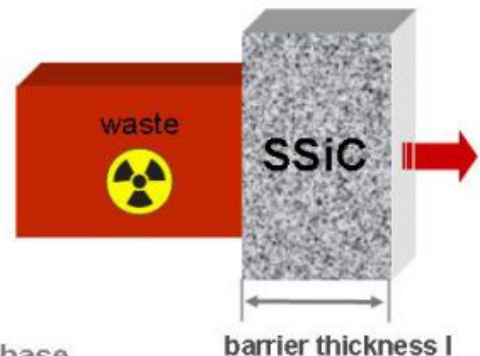
● breakthrough time t_B

$$t_B = l^2 / 6D$$

l = thickness of barrier

D = diffusion coefficient of nuclide in barrier material

- The breakthrough time t_B describes the initial phase of diffusion before equilibrium has been reached.
- The breakthrough time t_B characterizes the maximal retention time of the barrier.
- t_B decreases with increasing temperature.



● diffusion rate (steady state) : $\sim D/l$

- Source term Q_i is proportional to diffusion rate.
- Diffusion rate increases with increasing temperature.

Two parameters characterize the exceptional retention capability of SSiC for radioactive fission products:

- the **breakthrough time**
- the **diffusion rate**

The **breakthrough time** describes the phase of diffusion through the barrier wall before equilibrium has been reached. It **characterizes the maximal retention time** for source term ZERO.

Later, the source term Q becomes proportional to the diffusion rate.

Obviously, thick walls give long break through times and low leakage rates.

The question is: **How thick is thick enough?**