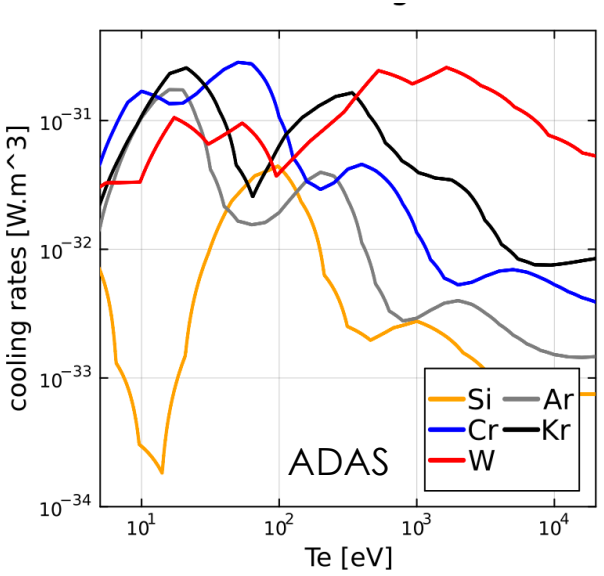
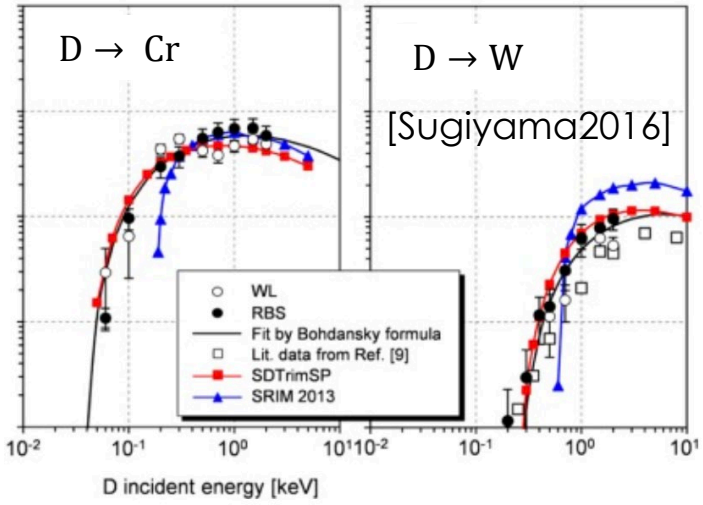
Chromium: an excellent candidate for DIII-D first wall material

J. Guterl, G. Dose

	Chromium (Cr)	Tungsten(W)
Cost	$5.65/lb	$3.25/lb
Z	24	74
A	52	184
Electron config.	[Ar] $3d^5 4s^1$	[Xe] $6s^2 4f^{14} 5d^4$
Th. conductivity	94 W/(m K)	170 W/(m K)
Melting temp.	1907 °C	3422 °C
Th. Stress parameter $\frac{\alpha E}{\lambda}$	14 MPa / (MW/m2) / mm	10 MPa / (MW/m2) / mm

Cr is an excellent candidate for DIII-D first wall material!



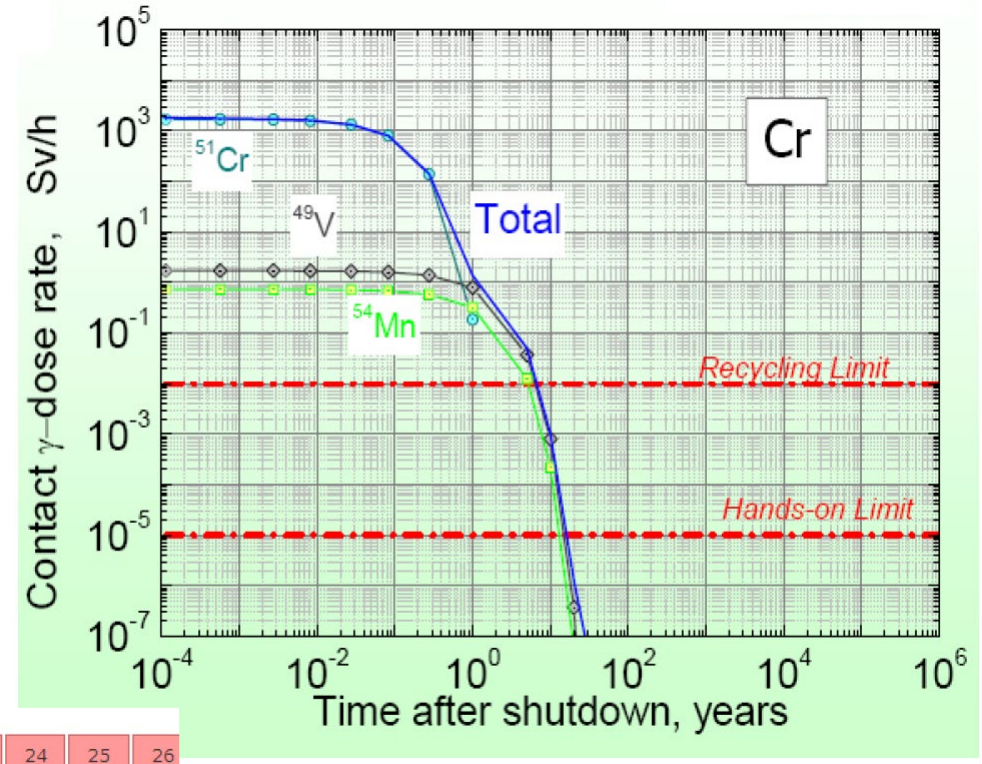


- **Core plasma:** Cr radiation << W radiation
- **SOL plasma:** excellent intrinsic SOL radiator
- Low sputtering yield (first wall)
- **Metallic wall**: good oxygen getter, no chemistry codeposit with D (s shell)
- Cr PFCs investigated for EU-DEMO [Noce2023]
- **FPP relevant**: Low activation, good thermal conductivity, no hydrogen embrittlement

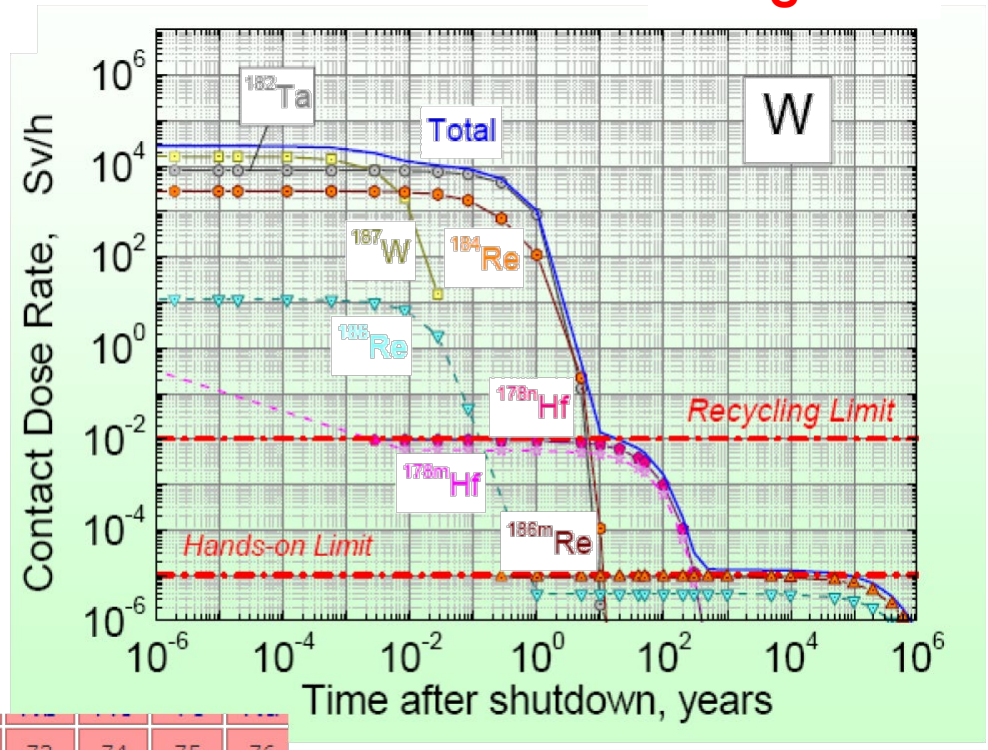
Optimal activation properties

Shutdown dose after the whole EU-DEMO fluence

Chromium



Tungsten



Courtesy of U. Fischer, KIT

Handling possible after < 30 years!