Table 4: Material properties.

Fuel properties	**Correlations**
Melting temperature (K) (bu in [GWd/t_{HM}])	$T_m = 2964.92 + [(3147 - 364.85 \cdot [Pu] - 1014.15 \cdot x) - 2964.92] \cdot e^{\frac{-bu}{40.43}}$
Thermal conductivity (W m^{-1} K^{-1}) – U-Pu MOX (T in [K], bu in [/ FIMA] = fractional burnup)	$\lambda = \left(\frac{1}{1.528\sqrt{x+0.0093} - 0.1055 + 0.44 \cdot bu + 2.885 \cdot 10^{-4} \cdot T} + 76.4 \cdot 10^{-12} \cdot T^3\right) \cdot 1.16 \cdot \frac{1-p}{1+2p}$
Thermal conductivity (W m^{-1} K^{-1}) – UO_{2-x} (T in [°C], bu in [/ FIMA] = fractional burnup)	$\lambda = \left(\frac{1}{0.115 + 2.6 \cdot 10^{-3} \cdot bu + 2.475 \cdot 10^{-4} \cdot T} + 1.216 \cdot 10^{-2} \cdot e^{1.867 \cdot 10^{-3} \cdot T}\right) \cdot \frac{1 - (2.58 - 5.8 \cdot 10^{-4} \cdot T) \cdot p}{1 - (2.58 - 5.8 \cdot 10^{-4} \cdot T) \cdot 0.05}$
Linear thermal expansion coefficient (°C^{-1}) (reference: 25°C)	$\alpha_L = 1.2 \cdot 10^{-5}$
Young's modulus (MPa)	$E = (22.43 \cdot 10^4 - 31.19 \cdot T[°C]) \cdot (1 - 2.6 \cdot p)$
Poisson coefficient (-)	$\nu = 0.32$
Swelling strain (%) (bu in [GWd/t_{HM}])	$\varepsilon_{swe,tot} = 0.07 \cdot bu$
Cladding properties	
Melting temperature (°C)	$T_m = 1400$
Linear thermal expansion (-)	$\varepsilon_{th} = -3.101 \cdot 10^{-4} + 1.545 \cdot 10^{-5} \cdot T[°C] + 2.75 \cdot 10^{-9} \cdot T[°C]^2$
Density (kg m^{-3})	$\rho = 7900 \cdot (1 + \varepsilon_{th})^{-3}$
Specific heat (J kg^{-1} K^{-1})	$c_p = 431 + 0.77 \cdot T[K] + 8.72 \cdot 10^{-5} \cdot T[K]^{-2}$
Thermal conductivity (W m^{-1} K^{-1})	$\lambda = 13.95 + 0.01163 \cdot T[°C]$
Young's modulus (GPa)	$E = 202.7 - 81.67 \cdot 10^{-3} \cdot T[°C]$
Poisson coefficient (-)	$\nu = 0.277 + 6 \cdot 10^{-5} \cdot T[°C]$
Yield stress (MPa) at 0.2% strain	$\sigma_{Y,0.2\%} \begin{cases} 555.5 - 0.25 \cdot T[°C] & \text{if } T < 600°C \\ 405.5 - 0.775 \cdot (T[°C] - 600) & \text{if } 600°C < T < 1000°C \\ 345.5 - 0.25 \cdot T[°C] & \text{if } T > 1000°C \end{cases}$
Ultimate tensile strength (UTS) (MPa)	$\sigma_{UTS} \begin{cases} 700 - 0.3125 \cdot T[°C] & \text{if } T < 600°C \\ 512.5 - 0.969 \cdot (T[°C] - 600) & \text{if } 600°C < T < 1000°C \\ 437.5 - 0.3125 \cdot T[°C] & \text{if } T > 1000°C \end{cases}$
Rupture strain (%)	$\varepsilon_{rupt} = 8 + 4.74 \cdot 10^{-3} \cdot (T[°C] - 500) + 6.2 \cdot 10^{-5} \cdot (T[°C] - 500)^2$
Void swelling (%)	$\frac{\Delta V}{V} = 1.5 \cdot 10^{-3} \exp\left[-2.5\left(\frac{T[°C] - 450}{100}\right)^2\right]\left(\frac{\varphi}{10^{22}}\right)^{2.75}$
Thermal creep strain rate (% h^{-1})	$\dot{\varepsilon_\theta} = 2.3 \cdot 10^{14} \exp\left(\frac{-84600}{R \cdot T[K]}\right) \sinh\left(\frac{34.54 \cdot \sigma_{eq}}{0.8075 \cdot R \cdot T[K]}\right)$
Irradiation creep strain rate (% h^{-1})	$\dot{\varepsilon_{irr}} = 3.2 \cdot 10^{-24} \cdot \overline{E} \cdot \phi \cdot \sigma_{eq}$
Larson-Miller parameter (LMP)	$LMP = \begin{cases} T[K] \cdot (17.125 + \log_{10}(t_{rupt})) \\ \frac{2060 - \sigma_{eq}}{0.095} \end{cases}$
Coolant properties	
Melting temperature (°C) at atmospheric pressure	$T_m = 98$
Boiling temperature (°C) at atmospheric pressure	$T_b = 882$
Specific heat (J kg^{-1} K^{-1})	$c_p = 971.34 - 3.69 \cdot 10^{-1} \cdot T[°C] + 3.43 \cdot 10^{-4} \cdot T[°C]^2$
Density (kg m^{-3})	$\rho = 954.1579 + T[°F] \cdot (T[°F] \cdot (T[°F] \cdot 0.9667 \cdot 10^{-9} - 0.46 \cdot 10^{-5}) - 0.1273534)$
Dynamic viscosity (Pa s)	$\eta = 10^{-3} \exp\left(2.3 \cdot (0.5108 + \frac{220.65}{T[K]} - 0.2139 \cdot \log(T))\right)$
Thermal conductivity (W m^{-1} K^{-1})	$\lambda = 94 - 3.25 \cdot 10^{-2} \cdot T[°F] + 3.62 \cdot 10^{-6} \cdot T[°F]^2$
Nusselt number (-)	$Nu = 7 + 0.025 \cdot Pe^{0.8}$
Filling gas Thermal conductivity (W m^{-1} K^{-1})	$\lambda_{He} = 15.8 \cdot 10^{-4} \cdot T[K]^{0.79}$

Variables: bu = burnup (/ FIMA or GWd/t_{HM}); $\overline{E}$ = mean neutron energy (MeV); p: porosity (/TD); [Pu]: Pu content (at.%); R = gas constant = 1.986 cal mol^{-1} K^{-1};

T: temperature (°C or K or °F); t_{rupt} = time-to-rupture (h); x = 2.00-O/M: deviation from stoichiometry (-); φ = neutron fluence (n cm^{-2}); ϕ: neutron flux (n cm^{-2} s^{-1});

σ_{eq} = Von Mises equivalent stress (MPa).