CANISTER REPRESENTATION FOR THM PROBLEMS

It is usual that a numerical model representing a disposal of nuclear waste includes a canister. The 2D or 3D zone representing the canister must have adequate properties in order to account for the interaction with the buffer in an adequate way. The following table summarizes the values.

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| --- | --- | --- |
| **Canister: specific properties to solve THM problems** | | |
| Initial Porosity | 0.01 | Initial condition applied on surface or volume |
| Initial Liquid Pressure | -100 MPa | Initial condition applied on surface or volume |
|  |  |  |
| Solid density | kg m-3 | Calibrate to obtain realistic canister weight |
| Specific heat | 450 J kg-1 K-1 |  |
| Elastic Modulus | 21000 MPa |  |
| Thermal expansion of medium | 0.0 K-1 | P3 in Linear Elasticity 2 |
| Thermal expansion of solid | 0.0 K-1 | P3 in Solid Phase Properties |
|  |  |  |
| Intrinsic permeability | m2 | P1, P2, P3 in Intrinsic Permeability |
| Tortuosity for diffusion of vapor | (-) | P3 in Diffusion for Vapour |
| Retention curve parameter P0 | 30 MPa | P1 in Retention curve |
| Thermal conductivity | 390 W m-1 K-1 |  |
|  |  |  |
| Biot Coefficient (coupling H to M) | (-) | P7 in Linear Elasticity 1 |
| Coupling option (coupling M to H) | UNCOUPLED | P7=1 in Construction and Excavation |

The main aspects that are needed are thermo-mechanical. The canister must be able to accumulate some energy, and this depends on the density and specific heat. Both variables can be modified for a material. If the weight of the canister and its volume are known, the solid density can be calculated. Since porosity cannot be 0 in CODE\_BRIGHT, a small value can be considered for the canister.

From a mechanical perspective, the canister can be considered elastic. Additionally, a specific copper law implemented in section of viscous models can be combined with elasticity.

In principle, the hydraulic part is not necessary. In order to keep fluid variables as neutral as possible, a set of values for permeability, retention curve and tortuosity can be accommodated. These are included in the table.

UNCOUPLED: using P7 = 1 at the “Construction and Excavation field” kills the coupling from mechanical to hydraulic. In short, the volumetric deformation term in the mass balance equation that is responsible for M to H coupling is not considered at all. This avoids pressure changes due to volumetric deformations.

Note: Biot and Tortuosity cannot be set to 0 because CODE\_BRIGHT uses DEFAULT=1.0. Hence a very small value must be input to minimize the corresponding effect.