PyroFoam Governing Equations

**Continuity for each phase**

**Pressure Equation**

Problem: when and there is no mass source this reduces to

which while correct, has no pressure term­ and will cause division by zero errors in solution. To alleviate this, we allow the compressibility to be non-zero (but very small) in the solid

In the solid region, this gives

And since the estimated flux is zero in the solid region, the pressure simply remains constant.

**Momentum Equation**

The momentum in a cell consists of the fluid momentum and the solid momentum

Since we regard the solid as stationary, the total momentum consists only of the fluid portion

The same issue that arises in the pressure equation is also present here, when the equation reduces to

Which has no dependence on . We can get around this in a similar manner. If we consider the “momentum-accepting” density of the cell to be

Which means that for cells that are mostly solid, but have a very small amount of fluid, they can accept a small amount of momentum but their high mass damps out any velocity changes. Thus these cells have a “mostly” constant velocity due to momentum flux.