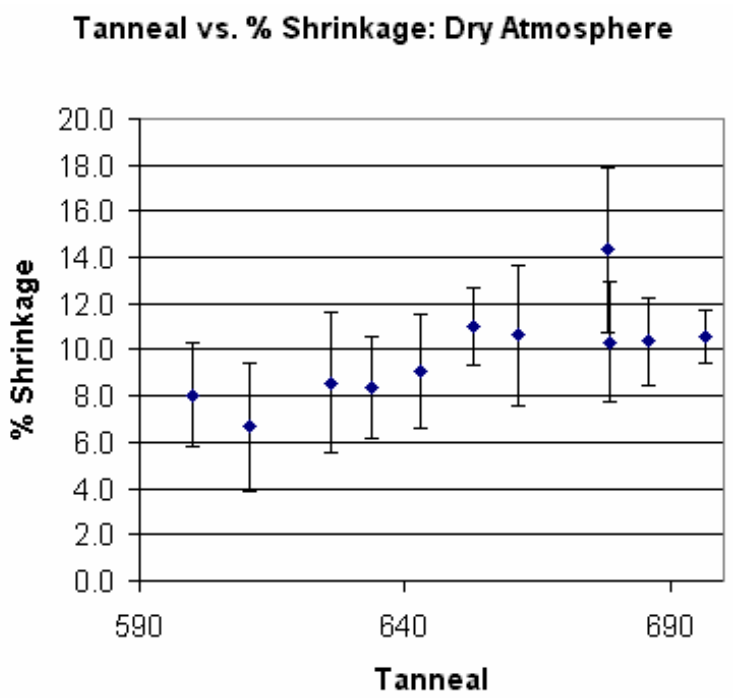
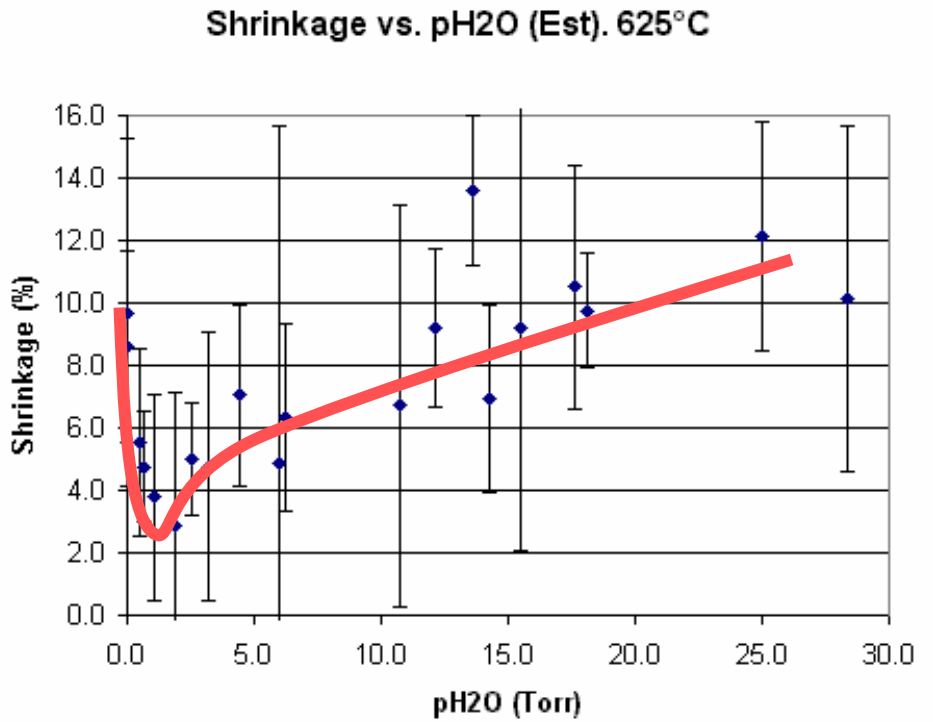
Course of reaction via shrinkage measurement

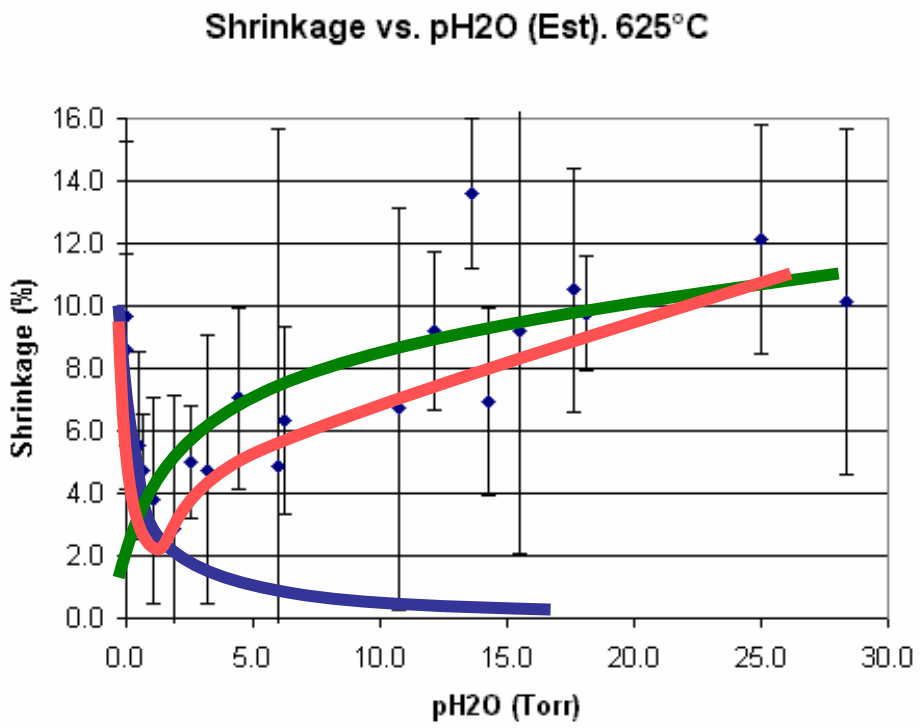
- Shrinkage vs. pH_2O: 600-700C
  - Dry annealed films shrink ~10% over wide range of T
  - pH_2O dependence on shrinkage increases as T decreases
  - Apparent minimum shrinkage at low, non-zero pH_2O





Course of reaction via shrinkage measurement

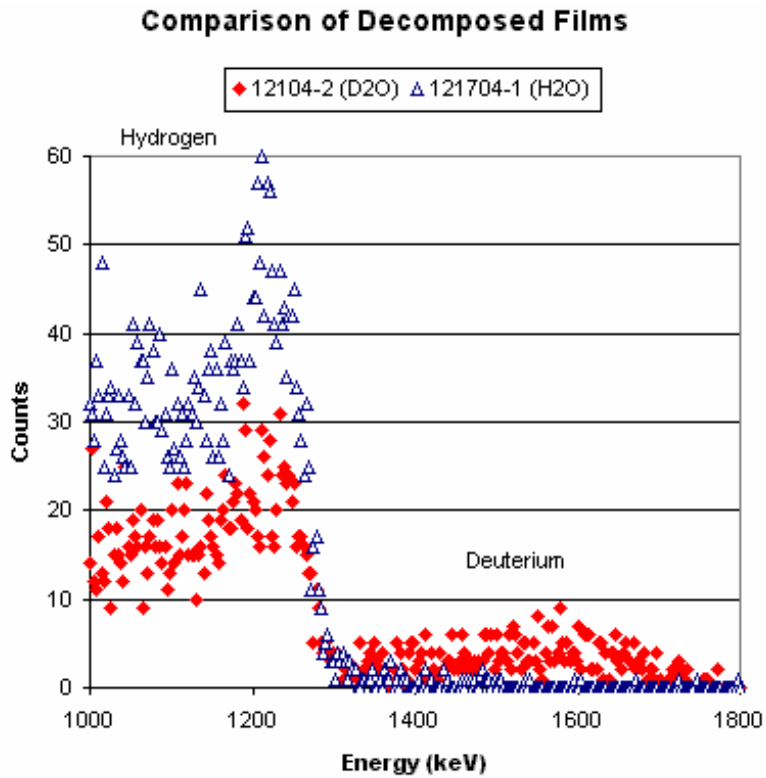
- Shrinkage vs. pH_2O: 625C
- Low pH_2O:Decomposition
  - $Ba(OH)_2 \rightarrow BaO + H_2O$ (A)
- High pH_2O:Equilib. Melt
  - pH_2O suppresses reaction A
  - $Ba(OH)_2 + BaF_2 \rightarrow 2\ Ba(OH,F)_{(L)}$ (B)
- Competing Reactions
  - Increasing pH_2O suppresses decomposition and less shrinkage
  - Increasing pH_2O stabilizes liquid and increases shrinkage



FRES (Forward Recoil Elastic Scattering) used to detect deuterium

Testing the Hydroxide Hypothesis

- No D found in samples annealed in saturated D_2O atmosphere after decomposition in H_2O/O_2
- D peak clearly seen in samples ***decomposed*** in D_2O / O_2 atmosphere
- Evidence supports hydroxide formation during decomposition stage
  - •Elevated T promotes hydrolysis
  - •Dry gas, high T: hydroxides decomp.
  - •BaF_2 peak shifts gone after **dry anneal**- $BaF_2/BaOH_2$ SS?



Possible Decomposition Hydrolysis Reaction (at <300C):

$$Ba(CF_3COO)_2 + 2\ H_2O \rightarrow Ba(OH)_2 + 2\ CF_3COOH$$