



# Water Capacity of TufFoam

Kristina Fuller, Bernice Mills, April Nissen

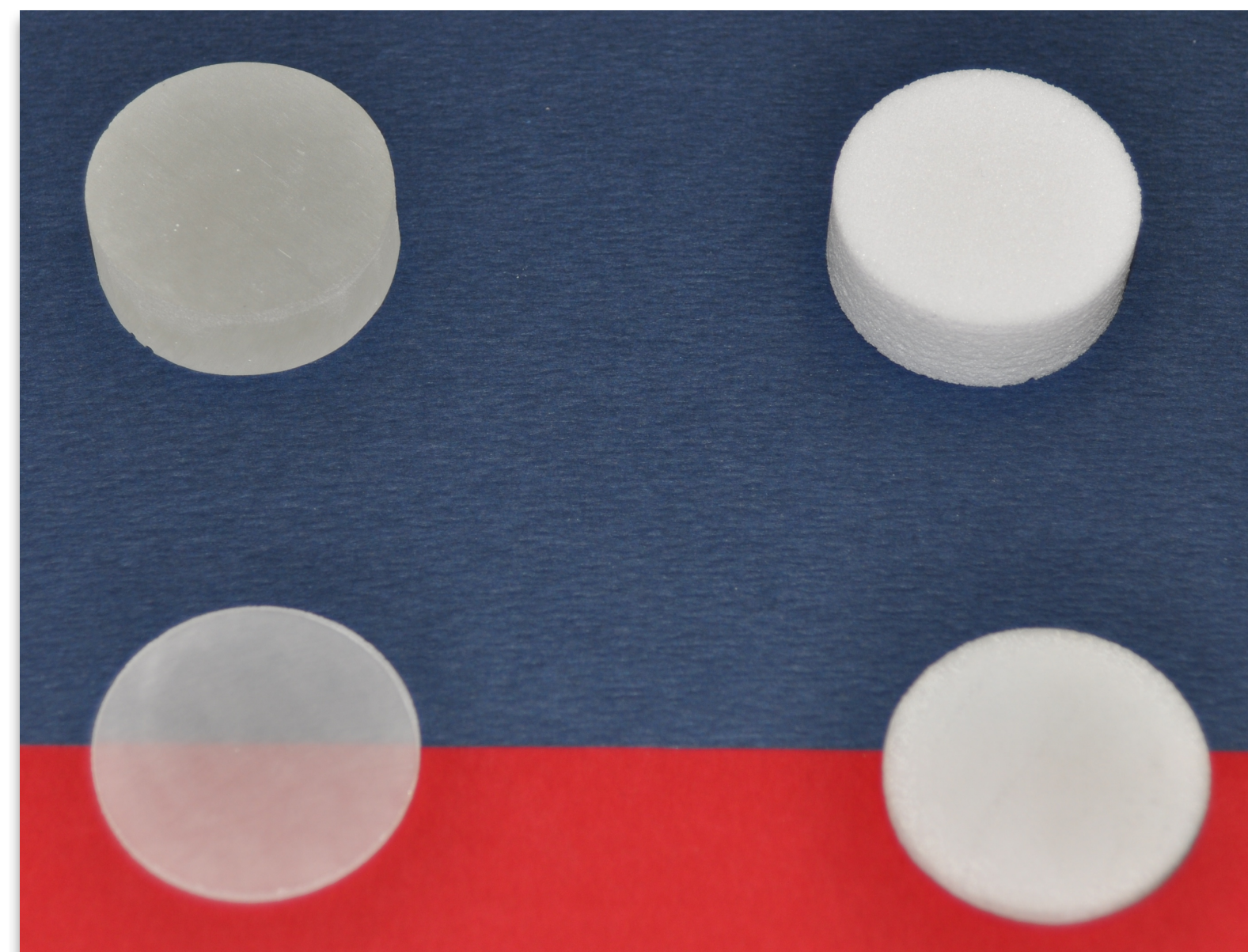
Sandia National Laboratory, Livermore, California



## Introduction

TufFoam is a Sandia-developed, closed cell polyurethane foam for insulation and impact force dispersion. Unlike similar commercially available foams, TufFoam does not require the carcinogenic compound toluene diisocyanate in the production process. Properties of foams can change as water is dissolved into the polymer and so this study is a preliminary examination of the capacity of TufFoam to absorb water.

Samples of TufFoam: the high density disks (left) are translucent. Disks have 3.6cm diameters



Samples with grating for separation, in a stainless steel canister with a conflat flange

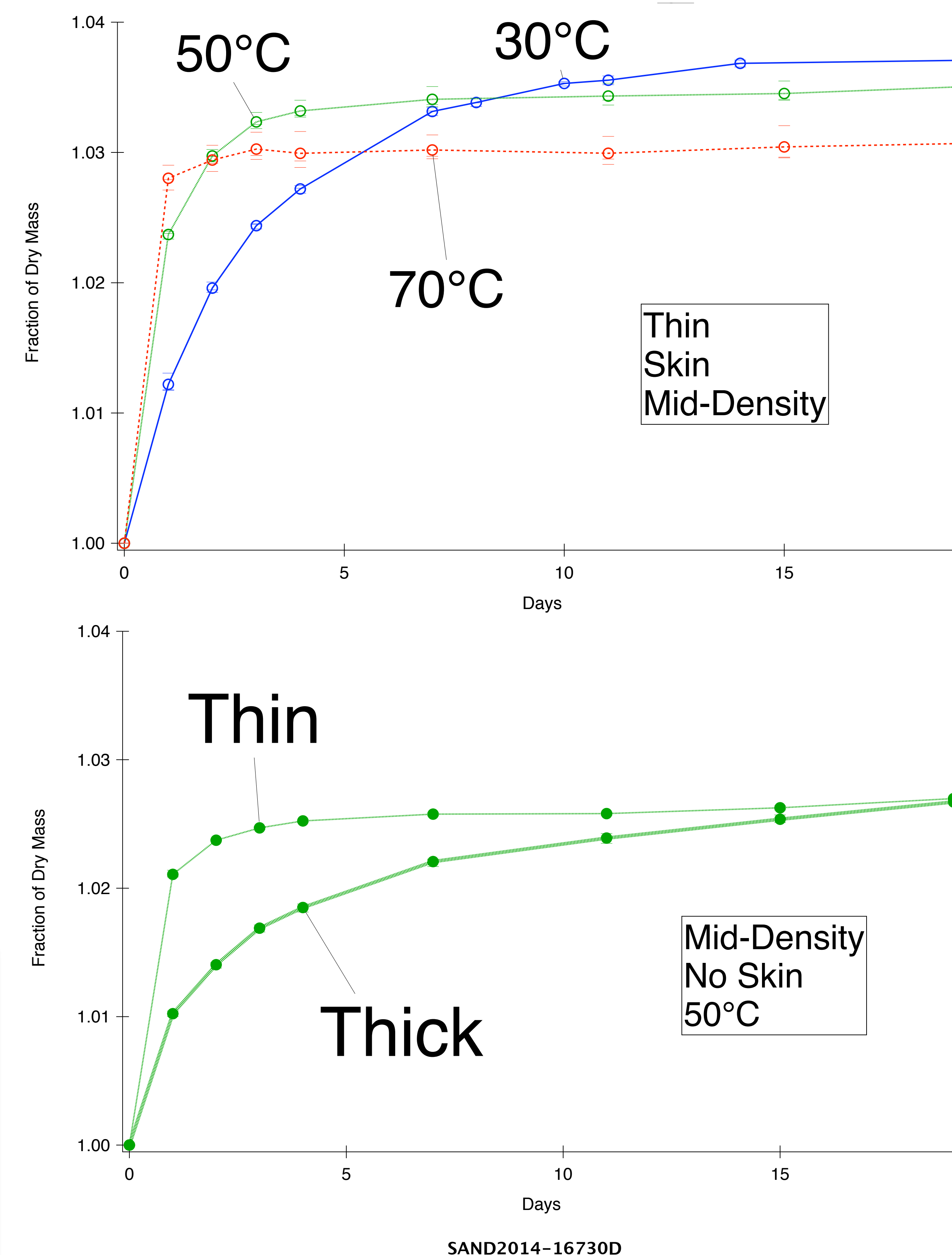
## Variables of Interest

- **Density:** ~0.35g/cc, ~0.55g/cc, and ~1.2g/cc
- **Disk thickness:** 0.3 cm and 1 cm
- **Skin:** original exterior maintained and removed
- **Temperature at 100% RH:** 30°C, 50°C, and 70°C

3 densities × 2 thicknesses × 2 skin conditions × 3 temperatures × 3 replicates = 108 disks

## Procedures

- Samples were weighed at initial, ambient condition and throughout the two week drying process. Samples were dried in ovens between 70 and 80°C.
- When weight loss slowed to 0.02% per day, dried samples were transferred to canisters with 100% relative humidity (RH). Three replicate disks for each combination of variables were tracked over three weeks.

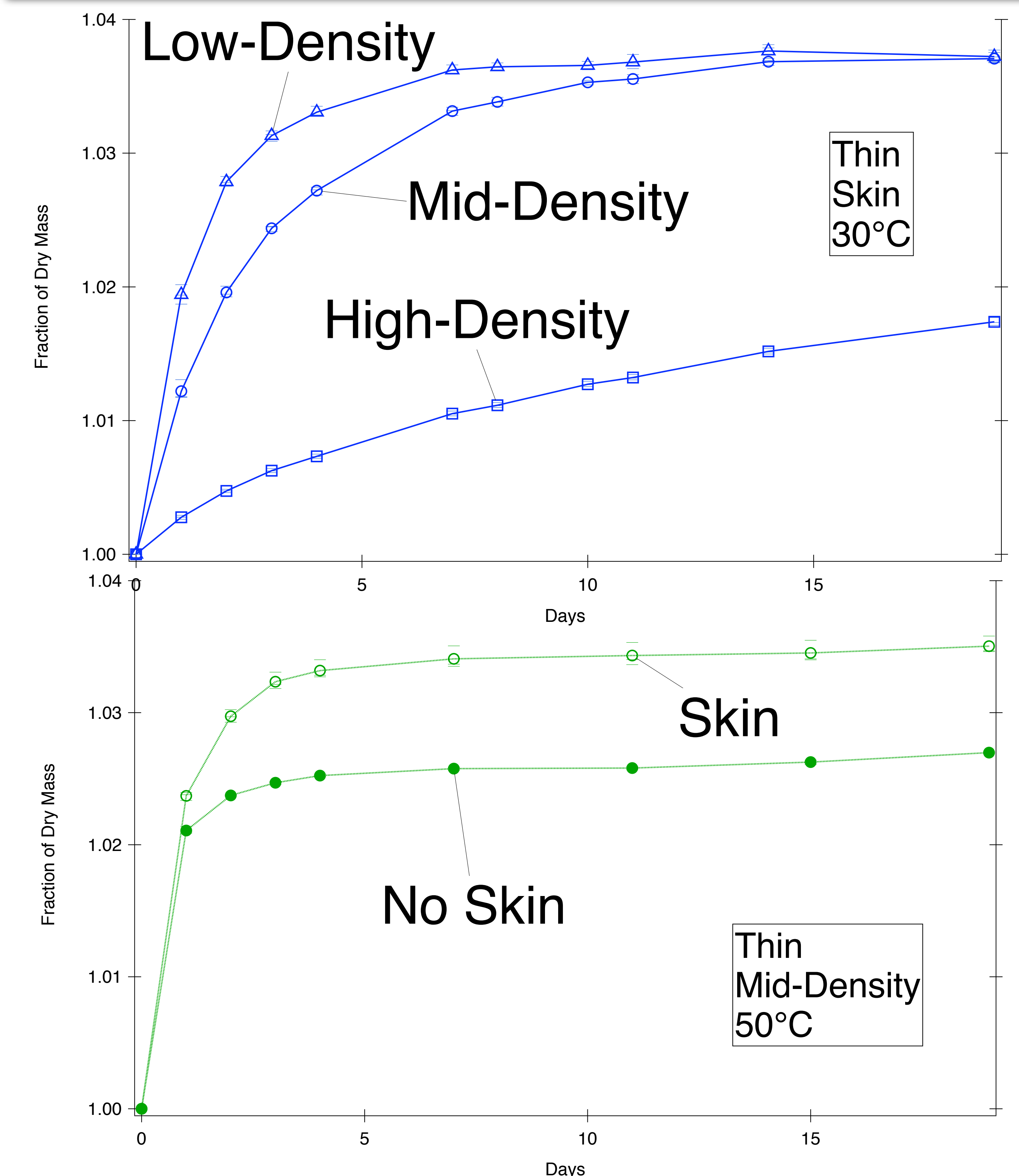


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## Conclusions

TufFoam takes about two weeks to oven-dry to steady state from ambient conditions of ~24°C and ~50% RH and loses ~1% of its mass. Subsequent weight gain is more dramatic initially for disks that are thinner and have lower densities. Skin increases later water absorption. Higher temperature causes faster initial weight gain that tapers. Total eventual weight gain cannot be compared until more of the samples achieve steady state.



## Future Work

- Continue collecting data until equilibration.
- Compare mechanical and electrical properties of dry and saturated TufFoam.