Yirak, 08/04/2011

Contents

1 "Next round" from 110802

"I will probably run the above four jobs at 3.125um, as it looks like the lower resolution dampens the Vishniac (just remembered that I need to investigate for the critical γ for Vishniac)."

"The main large other goal of course is to get the mixed ideal/SESAME working. I just submitted a job trying air at $\gamma = 5/3$ ideal gas with the present setup."

I had more success with the first than the second.

2 Comparing gases, 3.125um resolution

The main question here is: is there a separation of behavior of the shocks in the different gases, specifically Vishniac? It looks like it.

Same Time

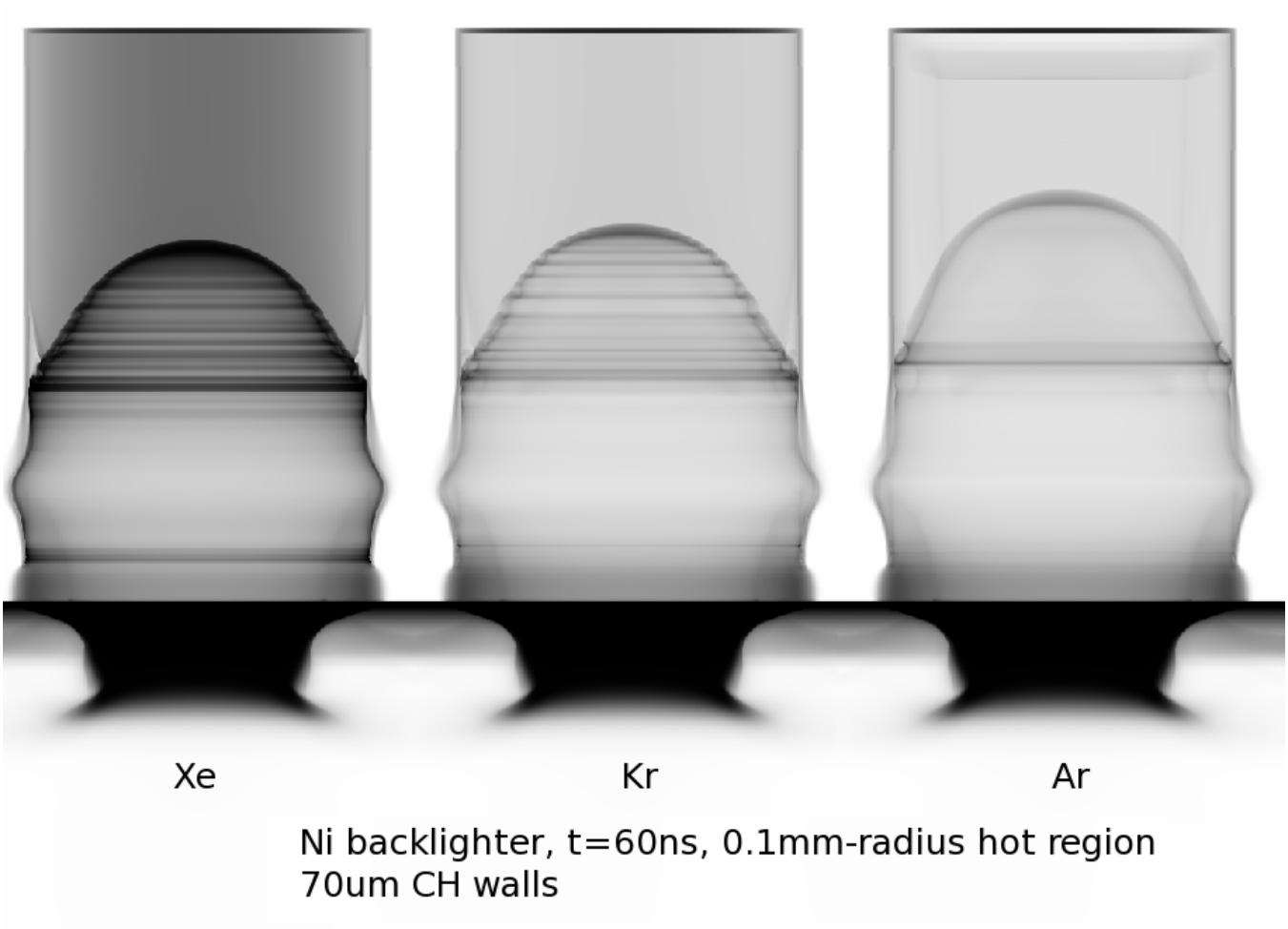

Figure 1: All 4 materials at the same time, t=60ns. 3.125um resolution.

There is a fairly clear distinction between Xe and Ar. Kr is slightly less unstable than Xe.
Note also the "wall shocks" with Xe, less apparent with Kr, and absent with Ar.

Same Place

The next figure shows Xe, Kr, and Ar at the end of the container:

Note that what looks like Ar potentially going unstable is actually from reflection off the top of the cylinder (cf. previous image).

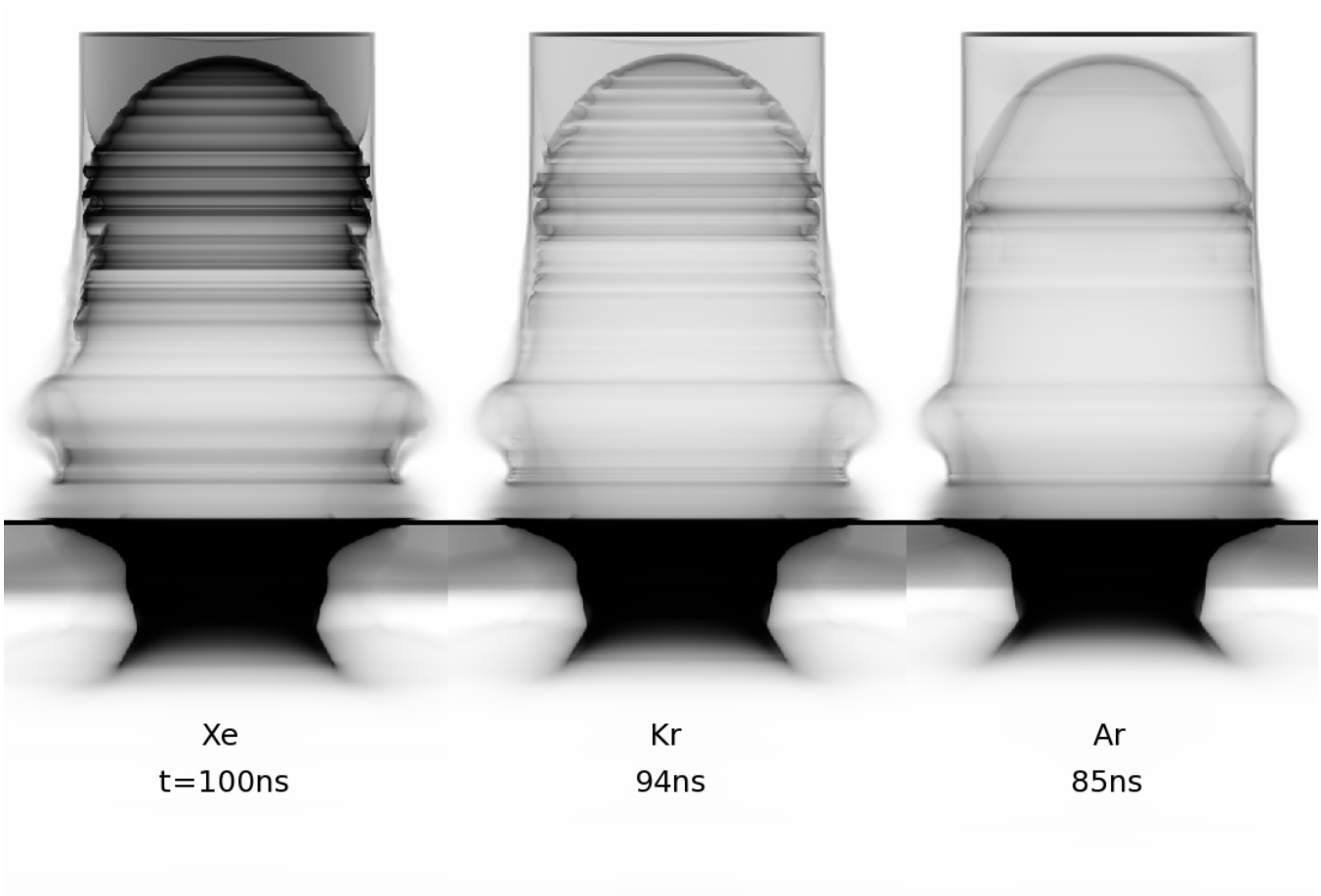

Figure 2: The three gases at the end of the container.

3 Comparing 3.125um vs. 12.5um resolution

Resolution plays a critical role in correctly initiating the instability. Consider:

Same Time

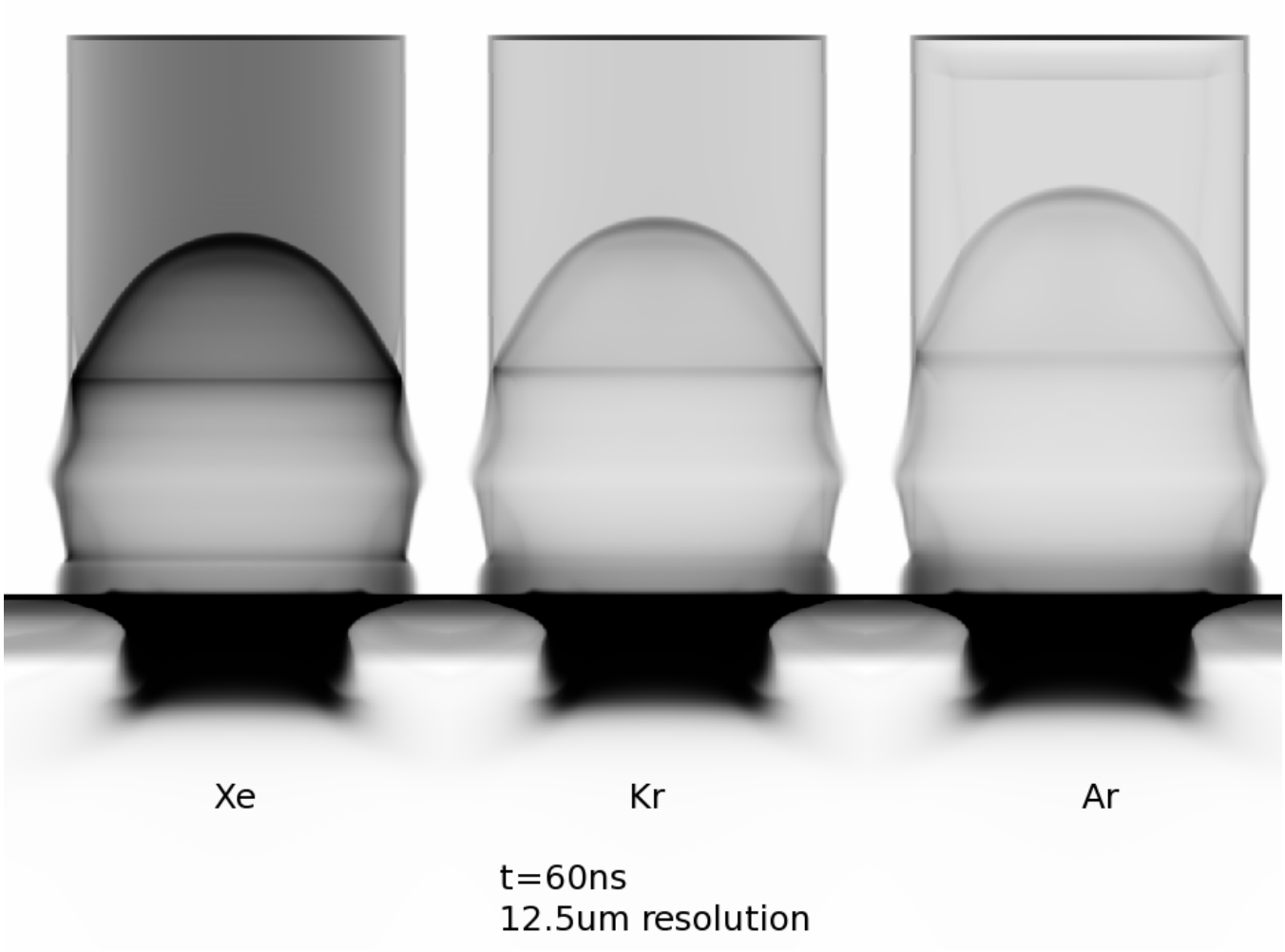

Figure 3: All 4 materials at the same time, t=60ns, at 12.5um resolution.

The instability is completely wiped out. Although, if we look at it at a later time, we see something interesting.

Same Place

If you look closely, you can see what appear to be smooth ripples in the shock in Xe and Kr. Damped Vishniac?

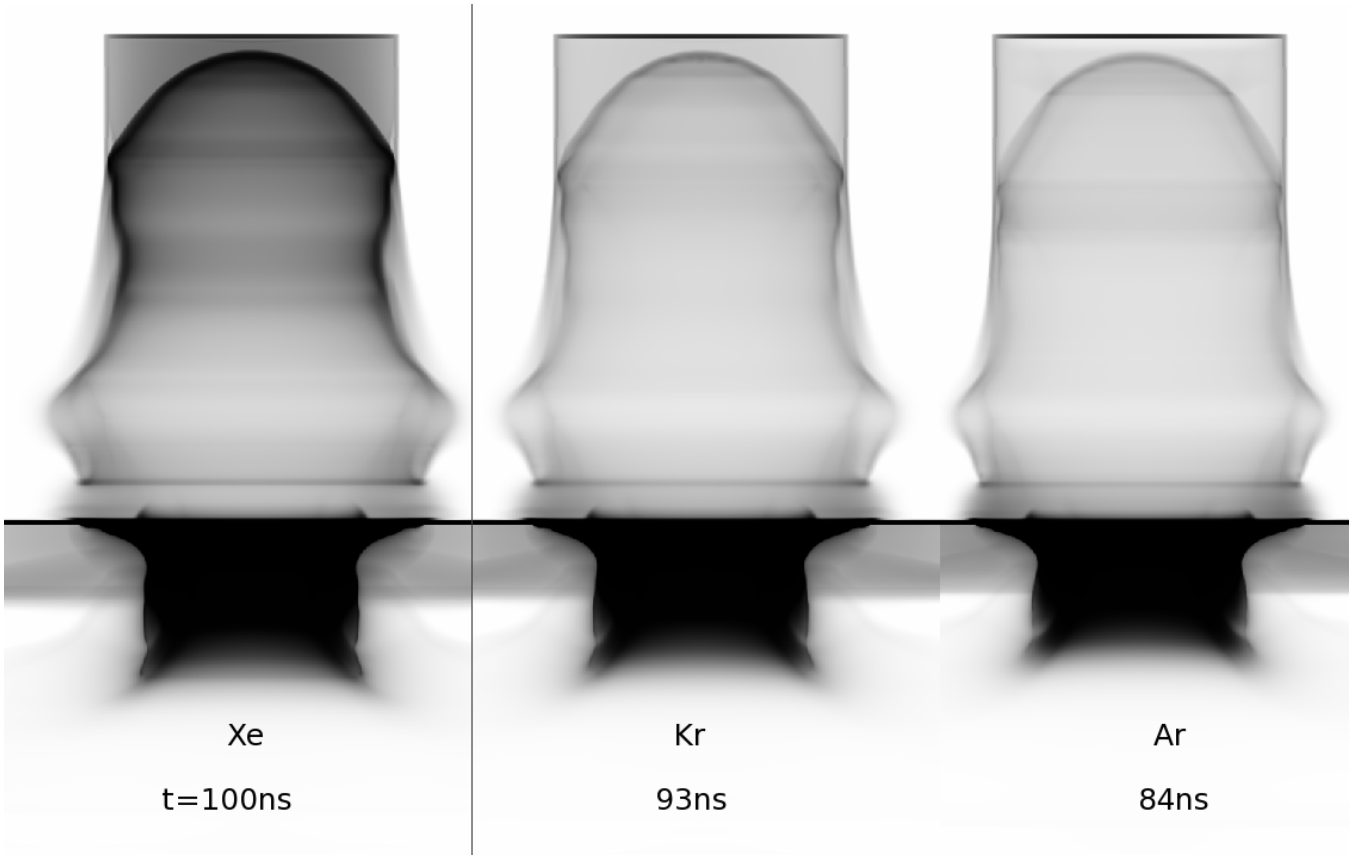

Figure 4: All 4 materials at the same place, 12.5um resolution.

4 Comparing size of 'hot CH' region with xenon

As Bernie pointed out, the size of the 'hot' CH region I started with yields an energy density which is too low: roughly 60eV at t=1ns. The size of the region was 1000um in radius and 250um in height, less an overlapping of the gold washer, of inner radius 800um and height 50um.

I have run two jobs to look at this, varying the region's radius: A) 800um (not covered by the washer), and B) 400um (also not covered by the washer, though I did reduce the washer's inner radius to 400um).

The new energy at 1ns is $\sim$ 100eV and $\sum$240eV, respectively. At 2ns these have dropped to 80 and 150eV, respectively. As the radius^2 for these differs by a factor of 4, I would have expected the energy to increase by this; instead it increases by a factor of 2.5. Perhaps this is due to energy escaping downwards? I've made changes that I think will increase the framerate up to 3ns to look at this.

For the runs I mention starting below, on the assumption that we're aiming for about 150eV, I interpolated the above results and have adopted a radius of 685um.

5 Evolution of the shock front

I didn't have time to make a figure, but for xenon, the shock front initially appears at a strength of about 0.14 g/cc (density jump$\sim$ 23.5), which gradually decreases until about 50ns, where it stabilizes to a value around 0.125 g/cc (density jump$\sim$ 21) for the rest of the run.

6 Ideal gas runs went nowhere

I intend to look into this a bit more myself and then reach out to crestone support.

7 Next round

Runs I have submitted today (and hopefully won't be sidelined by the cluster going down):

1. Xe, Kr, Ar, RF at 3.125um with the new radius and smaller time between HDFs initially
2. Xe, Kr at 12.5 with doubled extent in y to see if anything comes of the ripples
3. Ar at 1.5625 to see if I can get the instability to happen

Other runs and possibilities:

1. I still need to check if I'm mesh-aligned or not. It appears I might be slightly off in y.