Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Transient growth and controlled side branching of xenon dendrites MARCO FELL, J. H. BILGRAM, ETH Zurich, Switzerland — In our experiments we study the influence of transient growth conditions on the growth of xenon dendrites from undercooled melt. Here we report on the response of crystal growth on heating the melt. We start heating at a given temperature and steady-state growth. The dendrite tip reacts on this change by slowing down growth rate v and increasing tip radius R. We observe that side branches emerge from an unstable surface. As we continue heating up to slightly above melting temperature, the tip radius continuously decreases to a new value. The reverse temperature change unveils a hysteretic behavior: As soon as we cool down the melt from a temperature tight above melting temperature, v and R both increase. The curvature of the tip becomes too small to be stable at the given undercooling and an instability leads to a new, thin tip growing out of the oversized sphere-like tip. The value R^2v shows a sharp peak and then settles to a constant value in only about 20 seconds. The same instability also gives rise to side branches whose formation can be controlled by a repetitive application of the described mechanisms. Highly symmetric xenon crystals can be grown by this technique.

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Date submitted: 29 Nov 2005 Electronic form version 1.4