Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Spontaneous break-up of cylindrical nano-sheet into filament arrays by thermal drawing DAOSHENG DENG, N. ORF, A. ABOURADDY, Y. FINK, MIT — Thermal drawing has been state-of-art in the optical fiber community, during which macroscopic preform is heated into viscous fluid and stretched into extended long fiber while preserving the cross-section structure. Recently, a new type of multi-materials fiber that incorporates cylindrical sheets of glass into polymer matrix has emerged. Here, we report a novel physical phenomenon in which a cylindrical thin sheet spontaneously evolves into a periodic array of filaments when the sheet thickness reaches a critical length scale. Surprisingly, in contrast to other related phenomena, the axial dimension remains continuous. We propose a fluid instability mechanism to explain the observed phenomenon. A controlled and reproducible approach of thermal drawing processing is developed allowing us to follow the fleeting evolution of fluid breakup in a frozen solid state, resulting in unprecedented extended semiconductor nanofilaments.

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Date submitted: 05 Aug 2008 Electronic form version 1.4