

Abstract Submitted
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**Super acid processing of Single walled carbon nanotube (SWNT):
effect of SWNT aspect Ratio on Macroscopic properties** NATNAEL BE-
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PASQUALI, Rice University — Single walled carbon nanotubes are exceptional build-
ing blocks that combine great mechanical, electrical and thermal properties with
low density. A number of processing techniques have been proposed to manufacture
macroscopic articles made purely of carbon nanotubes. Superacid processing is the
most flexible and promising of all since it allows dissolution of a wide range of car-
bon nanotube materials, including hundreds of micron long carpets. Here we show
how SWNT aspect ratio influences the rheology (both shear and extensional) of
SWNT/super acid solution. The longest SWNT (~ 10 microns as measured by cryo-
TEM) are able to form stable, highly aligned fibrils under elongational flow. Fibrils
thus made can be recovered and further characterized. These fibrils have some of
the lowest resistivity of SWNT based material to date ($160 \mu\text{m-cm}$). These materi-
als can also be processed into conducting and transparent films via dip coating and
vacuum filtration. Films made with the longest SWNT gave a sheet resistance of 150
Ohm/sq at 90% transparency. We have also mixed long SWNT at high concentra-
tion (10 wt%) and, as expected, they form liquid crystalline solution. Surprisingly,
we find that the viscosity of highly concentrated solution is not a function of the
aspect ratio of the constitutive molecules (unlike dilute solutions). This allows for
the high concentration solutions to be successfully spun into neat SWNT fibers.

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