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Orientation change of multi-walled carbon nanotube forests under low-Reynolds shear flow[1] FRANS JAN DE JONG, Hamburg University of Technology, ADELINE BUFFET, German Electron Synchrotron DESY in Hamburg — Due to their exceptional electrical, thermal and mechanical properties, multi-walled carbon nanotubes (MWCNTs) are popular for energy storage, biomedical applications and engineering. Indeed, due to the mechanical properties, MWCNTs show excellent sensing characteristics, which can be used for the development of sensors, e.g. liquid flow sensors, and actuators. Numerous dense packed upright standing MWCNTs form a so-called MWCNT forest. In the study presented here specifically tailored forests of MWCNTs are fixed in a microchannel and the orientation of the MWCNT forest is changed under shear flow, i.e. the MWCNT forest is tilted. The nonintrusive measurement technique microfocus small-angle X-ray scattering (muSAXS) is used to record the orientation change at various Reynolds numbers. The results show a linear relationship between the Reynolds number and the tilting of the MWCNT forest. Our investigations give an insight into the fluid structure interaction of MWCNT forests on the nanoscale. These findings constitute an important step in the understanding and thus the development of shear flow-induced stress sensors.

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