Abstract Submitted
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Polyvinylidene fluoride molecules in nanofibers, imaged at atomic scale by aberration corrected electron microscopy[1] DARRELL RENEKER, JOSEPH GORSE, DINESH LOLLA, The University of Akron, CHRISTIAN KISIELOWSKI, Lawrence Berkeley National Laboratory, JIAYUAN MIAO, PHILIP TAYLOR, Case Western Reserve University, GEORGE CHASE, The University of Akron — Atomic scale features of polyvinylidene fluoride molecules (PVDF) were observed. Electron micrographs of thin, self-supporting PVDF nanofibers showed conformations and relative locations of atoms in segments of polymer molecules. Rows of CF2 atomic groups, at 0.25 nm intervals, marked the paths of segments of the PVDF molecules. The fact that an electron microscope image of a segment of a PVDF molecule depended upon the particular azimuthal direction, along which the segment was viewed, enabled observation of twist around the molecular axis. The 0.2 nm side-by-side distance between the two fluorine atoms attached to the same carbon atom was clearly resolved. Morphological and chemical changes produced by energetic electrons, ranging from no change to fiber scission, over many orders of magnitude of electrons per unit area, provide quantitative new insights into radiation chemistry. Relative movements of segments of molecules were observed. Synergism between high resolution electron micrographs and images created by molecular dynamic modeling was demonstrated. This paper is at the threshold of growing usefulness of electron microscopy to the science and engineering of polymer and other molecules.

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