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Flexible metallic nanowires with self-adaptive contacts to semiconducting transition-metal dichalcogenide monolayers JUNHAO LIN, Vanderbilt Univ, OVIDIU CRETU, National Institute of Advanced Industrial Science and Technology (AIST), WU ZHOU, Oak Ridge National Lab, KAZU SUENAGA, National Institute of Advanced Industrial Science and Technology (AIST), DHIRAJ PRASAI, KIRILL BOLOTIN, Vanderbilt Univ, NGUYEN CUONG, MINORU OTANI, National Institute of Advanced Industrial Science and Technology (AIST), SUSUMU OKADA, University of Tsukuba, ANDREW LUPINI, JUAN IDROBO, Oak Ridge National Lab, DAVE CAUDEL, Vanderbilt Univ, ARNOLD BURGER, Fisk University, JIAQIANG YAN, University of Tennessee, NIRMAL GHIMIRE, Oak Ridge National Lab, DAVID MANDRUS, University of Tennessee, STEPHEN PENNYCOOK, Oak Ridge National Lab, SOKRATES PANTELIDES, Vanderbilt Univ — We report direct electron-beam sculpting of ultrathin nanowires connecting designated points within semiconducting transition-metal dichalcogenide (TMDC) monolayer. In-situ electrical measurements reveal the nanowires are intrinsically metallic. The nanowires remain conducting and maintain structural integrity as they undergo continuous electron-beam-induced rotations and flexing, indicating their self-adaptive connections to the monolayers. The observed mechanical behavior is explained by density-functional-theory calculations, which further predict that the metal-semiconductor contacts could be Ohmic to p-type TMDC monolayers. These metallic nanowires can, therefore, serve as interconnects in future flexible nano-circuits fabricated entirely within a monolayer.

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