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A grand challenge in the field of bioelectronics is to develop soft, deformable, and adaptive materials with a wide range of functionality. In order to address this challenge we are working to develop 2D, highly deformable electronics with bioactive chemistries capable of specific and dynamic interactions with biomolecules. Over the last reporting period, we successfully developed two classes of bioactive organic semiconductors amenable for 2D assembly: p-conjugated polymers with biofunctionalizable side chains and electronically active p-conjugated oligopeptides. We also demonstrated fabrication of highly ordered 2D monolayer transistor devices over centimeter scale using a dynamic templating method for the first time and also fabricated monolayer sensors that can sense ammonia of concentration as low as 1 ppb. We further discovered unique structural and electronic properties of monolayer devices compared to bulk counterparts.

