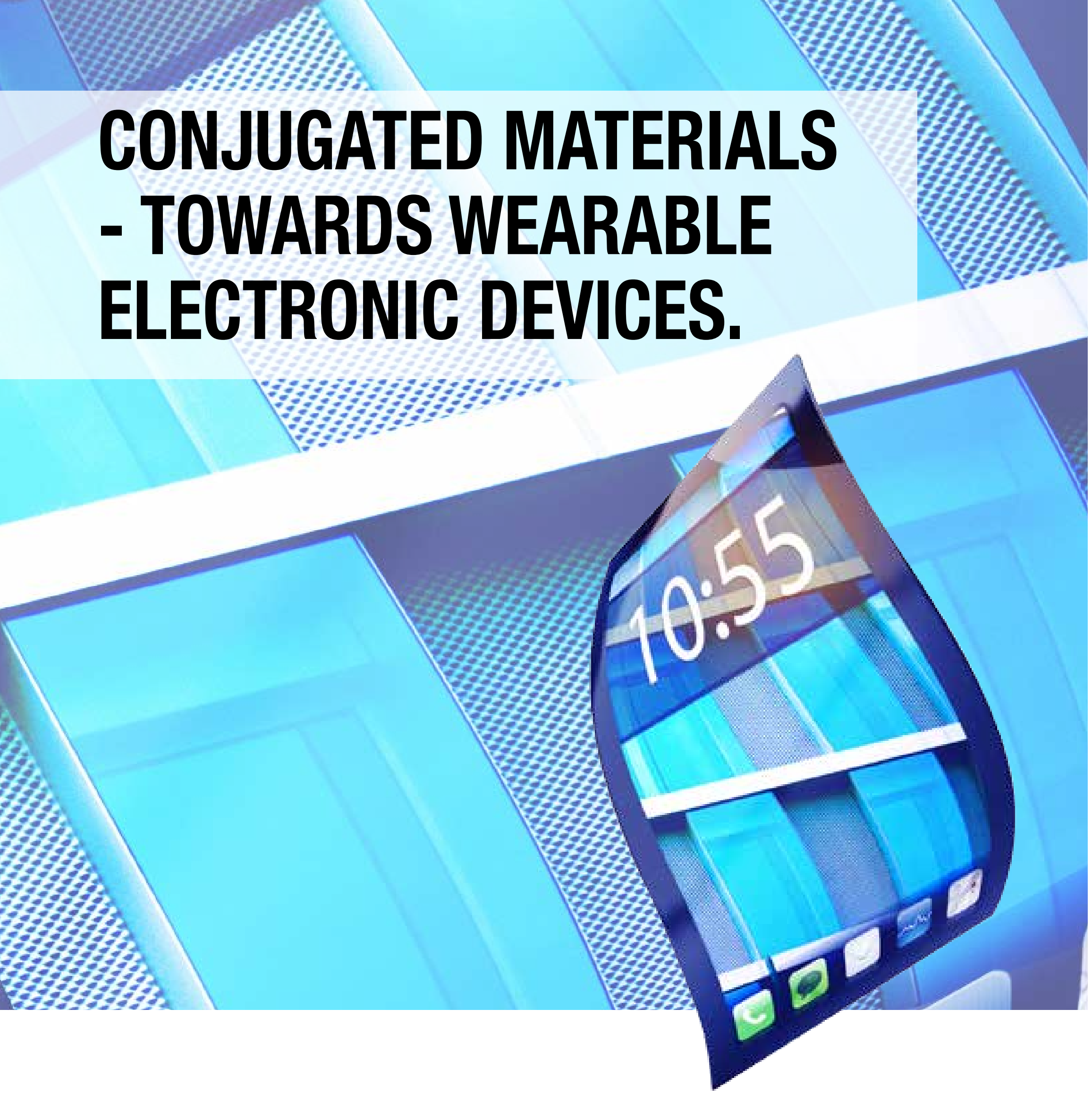
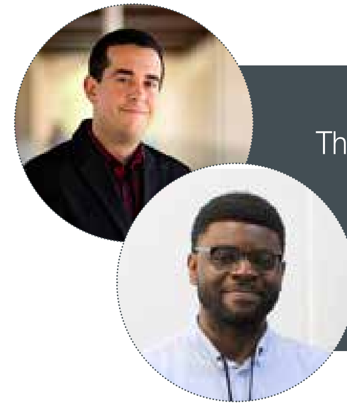
CONJUGATED MATERIALS - TOWARDS WEARABLE ELECTRONIC DEVICES.

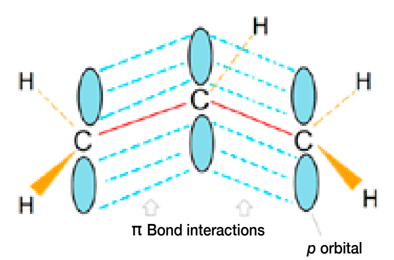


The internet has connected our world in ways no one could have imagined. No longer just connecting our personal computers, the internet now connects our cars, phones, personal electronics, and even our refrigerators. This is just the beginning of the new "internet-of-things" that attempts to connect us in even more unique ways. We can imagine wearable devices built into our clothing and portable devices utilizing flexible screens that roll-up like a piece of paper. For this to become a reality, new materials with enhanced stretchability and robustness need to be developed.

Conjugated materials, especially polymers, are a particularly interesting class of compounds. Conjugated materials are materials where the p-orbitals of adjacent atoms are overlapped. This overlap causes a delocalization of the electrons in the molecule, resulting in favorable electronic properties that can be used in organic electronics. Additionally, these materials possess good solubility that allows device manufacturing and fabrication via ink-jet printing. "Despite these interesting properties, a lot of improvements must be achieved to expand their use in wearable and flexible electronic devices," says Simon Rondeau-Gagné at the University of Windsor. His research group focuses on the development of novel strategies to design new nanostructured conjugated polymers with properties such as stretchability, self-healing, biodegradability, and near-infrared absorption.



The University of Windsor's Simon Rondeau-Gagné and his student Michael Ocheje use X-ray Diffraction to understand the next generation of novel materials for electronics.



One of Rondeau-Gagné's graduate students, Michael Ocheje, is currently investigating the incorporation of dynamic supramolecular interactions into π-conjugated materials in order to control their morphology or overall structure and allow for better mechanical compliance. In Ocheje's recent publication in Macromolecules (2018, 51, 1336–1344), amide containing alkyl side chains on conjugated polymers are shown to form intermolecular hydrogen bonds between adjacent amide-containing side chains. This helps to control the morphology of the final polymer, which in turn can help improve the flexibility and stretchability of the material, without harming the electronic properties.

Ocheje uses a Proto AXRD benchtop powder diffractometer in his research to get a better understanding on the influence of dynamic interactions on the final thin-film morphology, which can be directly correlated to mechanical and electronic properties. Controlled self-assembly of conjugated polymers through hydrogen-bonding side chains is a promising strategy toward more efficient semiconducting polymers for thin film transistors and other organic electronics.