MRSEC SEMINAR SERIES

Northwestern University Materials Research Center

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High Temperature Semiconducting Polymers and Polymer Blends

Although high temperature operation (i.e., beyond 150 Celsius) is of great interest for many electronics applications, it is fundamentally challenging to achieve stable carrier mobilities for organic semiconductors at elevated temperatures. My PhD research demonstrated a general strategy to make thermally stable high-temperature semiconducting polymer blends, composed of interpenetrating semicrystalline conjugated polymers and high glass-transition temperature (Tg) insulating matrices. When properly engineered, such polymer blends display a temperature-insensitive charge transport behavior with hole mobility exceeding 2.0 cm²/Vs across a wide temperature range from room temperature up to 220 Celsius in thin-film transistors. This seminar will highlight the design principles towards realizing thermally stable operation in such polymer blends. The impact of spatial confinement attained by using high Tg host matrices on the molecular ordering will be discussed as a general strategy towards thermally stable organic electronics. I will also highlight part of my postdoctoral research which aims to utilize this blending strategy to manufacture polymer-based neuromorphic devices, and to demonstrate their compatibility with industry standard back-end thermal conditions.

Aristide Gumyusenge is currently a Postdoctoral Researcher at Stanford University (advisors: Prof. Alberto Salleo, MSE and Prof. Zhenan Bao, ChemE) as the 2020 GLAM Postdoctoral Fellow. He obtained his PhD in chemistry from Purdue University in 2019 (advisor Prof. Jianguo Mei, Chem) after earning a BS in chemistry from Wofford College in 2015. He is originally from Rwanda where he grew up and attended primary and secondary school. His research background and interests are in semiconducting polymers, their processing and characterization, and their unique role in the future of electronics. Through novel processing strategies, especially large-area manufacturing of electronic devices, he is interested in relating molecular design to device performance.



Aristide Gumyusenge Stanford University Tuesday, Mar. 16, 2021, 4:00 p.m. Central Time Join Zoom Meeting: <u>https://northwestern.zoom.us/j/94113064844?pwd=</u> <u>c0J1ZnM1QzZqRm5PazAvVXh1MnUrQT09</u> Meeting ID: 941 1306 4844