Green Chemistry

FRIENDLY, FLEXIBLE AND FRUGAL

When you start up your computer, or grab your iPad for a few rounds of "Words with Friends," you probably don't think about fossil fuels and their impact on the environment. Nathan Tice does.

"Lots of people don't know that we use oil for far more than making gasoline," said Tice, UF assistant professor of chemistry. "There are petroleum-based products in plastics, polymers, resins and chemicals." According to Tice, oil is a major component in many video screens and computer parts.

As an environmentally conscious individual, it's only natural that Tice's research interests include advanced electronics, alternative (or "green") energy and high value fuels and chemicals for the biorefinery sector. Unlike oil refineries, biorefineries are plant-based and utilize trees, switchgrass, or other crops depending on where you're located.

"Basically, the biorefinery takes plant-based carbon and converts it to fuels and chemicals," added Tice.

Tice believes that there is a real need to diversify feedstocks (raw materials or fuel required for an industrial process), as an alternative to petroleum. While admitting that, at present, oil is cheap, he voiced concern about what will happen if oil prices rise significantly or if there is a supply shortage. In addition, he sees increasing difficulty and costs associated with fossil fuel exploration and capture. Resulting carbon dioxide emissions are also affecting climate change.

Altruism aside, Tice isn't only interested in green energy because it's good for the environment; it's also cost effective.

"Diversifying feedstocks is commercially viable," he maintained. "It's part idealism and part practicality."

A "FLEXIBLE" SOLUTION?

Traditional materials used in electronics, for example, are high cost, require "clean rooms" and are rigid. According to Tice, molecular electronics (based on organic and organometallic compounds) cost less to produce, can be created in a more practical environment, are flexible and can be added to solvents (inks). The unscientific among us can still appreciate that molecular electronics may someday soon make it possible to purchase paint for our houses that serves the same purpose as solar panels do today. These flexible properties could allow us to literally roll up our computers and stash them in purses or backpacks. There are already roof shingles that also act as solar cells (known as Building Integrated Photovoltaics).

Tice liked chemistry in high school because "it made sense out of the world." He feels that if a student is inquisitive and always wants to understand why something occurs, chemistry would be a good major.

NATHAN TICE, PH.D.
Assistant Professor of Chemistry

University of Kentucky
Ph.D. Inorganic Chemistry

Anderson University
B.A. Chemistry

"Basically, the biorefinery takes plant-based carbon and converts it to fuels and chemicals"

"Almost every industry employs chemists," he added. "Of course, there are more opportunities for those with an advanced degree. If you want to teach or manage a lab, you'll need a doctorate." He emphasized that UF has many students who minor in chemistry and go on to medical school or other pre-professional programs (e.g., dental school).

Tice introduces students to his research through the study of synthetic heterocycles after they have completed Organic Chemistry 2. He feels that the University has come a long way in offering research opportunities to students since his arrival on campus in 2014.

"We work a lot in the lab," he said. "Research is really an expansion of the classroom."

While in the past, chemistry and environmental sustainability may have seemed mutually exclusive, Tice is working to show that chemistry can have a major positive impact on renewable energy. He tries to incorporate sustainability practices into his personal life as well.

"Sustainability is more of a cultural and attitude change than embarking on big projects," he added.