# ABSTRACTS
# SECTION II. CHEMISTRY

### Paper Session
**Thursday Morning, 10:00 AM**
***KCC Room D***
**Christopher Stopera, Presiding**

1. 10:00 AM **u RECOVERY OF PRECIOUS METALS USING ORGANIC REDUCTION AGENTS. *Kayla Herren*, Chris Loveless, Jan Gryko, Jacksonville State University. Significant quantities of liquid waste containing precious metals is made by various industries. For example, silver waste is produced by photographic processes, and gold containing waste is generated by some analytical labs. We have used vitamin C and glycerol to recover these metals. We were able to recover practically 100% of silver from the photographic waste using vitamin C as the reduction agent. Similarly, using vitamin C, we recovered 100% of gold and palladium from an acidic waste. In both cases, silver and gold were recovered from raw waste at room temperature and without waste preprocessing. Platinum can also be recovered with approx. 99% recovery rate, but the process must be carried out at an elevated temperature.

***u* or ***g* Denotes presentation entered in student competition as an undergraduate or graduate student, respectively.

### SECTION II. CHEMISTRY
### Poster Session
**Thursday Morning**
**KCC *Atrium and Ballroom Hallway***
**Authors Set-up: Begins at 7:30 AM**
**Authors Present: Poster Session (10:30 AM – Noon); Viewing and Judging**
**Christopher Stopera, Presiding**

2. **u RECOVERY OF SILVER FROM SILVER WASTE. *Zora Rich*, Jade Stanley, Marilyn Tourne, Tuskegee University. The overall goal of the TIP research group is to improve the laboratory curriculum and the environment through Guided Inquiry experiments in undergraduate courses at Tuskegee University. Specifically, to develop a sequence of labs which create a “closed loop” for silver – the Ag Loop. This research focuses on the first phase of the Ag Loop – purification of silver waste and conversion to silver metal via an environmentally-friendly process. The recovery of silver takes place in various steps including centrifuging waste with deionized water, molar acidification with

a strong acid, agitation of waste using thiourea, filtration through a Büchner funnel and glass fiber filter, then finally drying in an oven at 100°C. These green processes are meant to convert silver ion waste (Ag+) to silver sulfide (Ag2S). Once silver sulfide (Ag2S) is obtained, the product is calcinated at 400°C for 6 hours to retrieve metallic silver (Ag0). Silver sulfide produced was calcinated then tested using Energy Dispersive Spectroscopy (EDS) as well as Fourier-Transform Infrared Spectroscopy (FTIR). FTIR data showed that the sample contained 80% silver. Through EDS analysis, it was shown that the sample consisted of 61% silver, 6% sulfur, and 32% oxygen.

3. **g SYNTHESIS AND CHARACTERIZATION OF AMINO ACID MODIFIED CARBON NANODOTS. *Garfield Grimmett*, Willard E. Collier, Taylor Williams, Brianna Tibbs, Tiyon Carter, Tuskegee University. Carbon nanodots (C-dots) are nanomaterials synthesized from carbon rich compounds that have strong fluorescence and tunable photoluminescence. 1 Carbon nanodots are easily produced, less toxic, inexpensive, bio-compatible, and more water soluble then semiconductor quantum dots.1 C-dots strong fluorescence and bio-compatibility, allows the potential of being used in bioimaging, nanomedicine, photovoltaic devices, sensors, and nanoprobe applications.2 C-dots unique photoluminescent properties are a result of their nitrogen and oxygen content. Amino acids are oxygen or nitrogen-rich compounds that can not only improve C-dots photoluminescence but also increase their surface functional groups, prevent particle aggregation and improve cross linking3. This study investigates the effects of amino acid modification on C-dot morphology, photoluminescence, and antimicrobial properties. C-dots were synthesized by the hydrothermal method with precursors arginine and methionine mixed with sucrose. The C-dot solutions were light brown and fluoresced light green. SEM, TEM, and XRD will be used to characterize morphology and crystal lattice structure. The paper disk diffusion method will be used to test the C-dots antimicrobial properties.

4. **u FORMULATION OF AN *ALOE VERA* GEL-BASED SKIN CARE PRODUCT USING ALL-NATURAL INGREDIENTS. *Marissa Jones*, Willard E. Collier, Tuskegee University. *Aloe barbadensis* miller, also known as *aloe vera*, is a drought-resisting, perennial plant that has been used medicinally for centuries. The fleshy inner layer of the *aloe vera* leaf contains 90% of *aloe vera's* beneficial ingredients. This layer is a transparent, gel-like portion that is mainly water along with essential amino acids, mineral, lipids, vitamins, and other compounds. Because of *aloe vera's* beneficial effects on skin, *aloe vera* is commercially cultivated in the United States, Mexico, China, Japan, and other countries with a current annual market value of $70-90 million. The global skin care market has surpassed $180 billion annually and is growing rapidly. As a result, the increased demand for natural *aloe vera* products has led to *aloe vera* being proposed as a new specialty crop for small farmers. The purpose of this initial research was to grow *aloe vera* plants locally and produce an effective, consumer acceptable *aloe vera* skin gel with natural ingredients. These natural ingredients include sodium benzoate (preservative), ascorbic acid (skin nutrient), vegetable glycerin (skin nutrient), and

tartaric acid (pH adjuster). A series of formulations were made by varying ratios of ingredients, number of ingredients, and water-based vs. non-water-based product. The use of water resulted in non-consumer acceptable gels. Other physical properties are discussed in the results section. In further studies, the all-natural gel will be compared to commercial *aloe vera* skin care products using NMR spectroscopy to detect adulteration.

5. **u THE USE OF *ALOE VERA* LEAF EXTRACT FOR THE SYNTHESIS OF SILVER NANOPARTICLES. *Nathalie Momplaisir*, Mohamed O. Abdalla, Mohamed A. Abdalla, Tuskegee University. Metal nanoparticles, specifically silver nanoparticles, have been used extensively in a variety of sectors due to their size, shapes, and additional physical and chemical properties. Biosynthesized metal nanoparticles based on green chemistry come with numerous advantages that encompass the reduction of hazards to the environment. This study is aimed to synthesize eco-friendly silver nanoparticles using crude extract from *Aloe vera* leaves and silver nitrate. It was hypothesized that the green synthesis of nanoparticles would result in innocuous and biocompatible nanoparticles that can be used in various areas of research and treatment. The *Aloe vera* extract was added drop wise to the silver nitrate solution. The appearance of a reddish-brown color was an indicator to the reduction of silver ions to form silver nanoparticles. The synthesized nanoparticles were dried at 400℃. The percent yield of the synthesized silver nanoparticles was extremely low. New approaches are underway to optimize the conditions of the synthesis.

6. **u CONSTRUCTING A THREE COMPONENT MANNICH REACTION USING A SILVER TETRANITRILE COMPLEX. *Quentoria Walton*, Morgan Fair, and Mohamed A. Abdalla, Tuskegee University. The need for novel, environmentally friendly catalysts has prompted scientist to engage in research to discover various homogeneous catalysis. This study utilizes a recyclable silver catalyst that is recovered from general chemistry waste reactions and can be used again in further works. The catalyst is used in a one-pot Mannich reaction using an amine, a ketone, and an aldehyde to synthesized the desired product. The objective of this study was to utilize an efficient, environmentally friendly catalyst in the three components Mannich reaction and recover this catalyst from the reaction for future reuse. A teranitrile ligand, propylenediaminetetrapropionitrile, was synthesized from 1,3 diaminopropane and acrylonitrile. The ligand was combined with AgNO3 to form the silver complex to prepare the catalyst. The Mannich reaction was prepared in methanol with the addition of aniline, benzaldehyde, and acetophenone as reagents with the catalyst and the reaction progress was monitored by thin-layer chromatography. The product was successfully obtained and characterized by ATR-FT-IR and NMR. The FT-IR analysis showed an amine peak (3367.19), the C-H carbonyl peak at (3059.97), the C=O carbonyl peak at (1079.73), and the C=C bond at (1358.05-1576.55) which is indicative of the spectra expected of the characterized product. From the NMR spectra, peaks around 6.6 -8 showed the protons on aromatic rings; peaks at 3.27, 3.7 and 5.0 showed the remaining hydrogens in the product. Based on the ATR-

FTIR and NMR results, the Mannich reaction was successful in achieving the desired product.

7. **u SYNTHESIS AND CHARACTERIZATION OF THE ZINC AND MANGANESE COMPLEXES OF 5,10,15,20-TETRA[3,4-DIBENZYLOXYPHENYL]PORPHYRIN. *Erin Hutchens*, Andrew Ezell, Hayes Palacio, and Prakash Bharara, University of Montevallo; Qiaoli Liang, University of Alabama; and Cynthia Tidwell and Trever Tidwell, University of Montevallo. Metalloporphyrins have been widely studied due to their applications in photochemical and biomedical fields. Metalloporphyrins are useful for an array of applications, such as in solar cells and as bactericidal agents. The objective of this research is the synthesis and characterization of zinc and manganese complexes of 5,10,15,20-tetra[3,4-dibenzyloxyphenyl]porphyrin. Both complexes were synthesized using conventional methods and were purified using silica gel column chromatography with chloroform as the eluent. Upon the metallation of the porphyrins, the electronic absorption spectra exhibited a shift in the Soret band and disappearance of some of the Q bands as was expected upon metallation. The zinc complex exhibited a Soret band at 426 nm and Q bands at 552 and 594 nm with corresponding molar absorptivities of $3.1 \times 10^5$ $cm^{-1}M^{-1}$, $1.5 \times 10^4$ $cm^{-1}M^{-1}$ and $5.5 \times 10^3$ $cm^{-1}M^{-1}$. The zinc complex gave an emission at 606 nm upon excitation in the Soret band and the quantum yield was determined to be 0.08 upon excitation at 515 nm. The manganese complex exhibited a Soret band at 482 nm and Q bands at 587 nm and 625 nm with corresponding molar absorptivities of $9.6 \times 10^4$ $cm^{-1}M^{-1}$, $9.5 \times 10^3$ $cm^{-1}M^{-1}$ and $1.3 \times 10^4$ $cm^{-1}M^{-1}$. The manganese complex did not fluoresce upon excitation at the Soret or Q bands. Additional characterizations of these compounds are currently underway.
8. **u AMINO ACID INTERACTIONS IN THE L-DOPA-AROMATIC L-AMINO ACID DECARBOXYLASE ENZYME COMPLEX. *Georgia Chamblee* and Donna Perygin, Jacksonville State University. We created a model in the MOE (Molecular Operating Environment) software package of the dimeric enzyme Aromatic L-amino Acid Decarboxylase (PDB 3RBL) and docked L-dopa into the putative active site. Interactions between this enzyme and its native ligand were studied to determine potential interactions for enzymatic activity. Strong (less than 5 angstroms) interactions with the A chain included D310, K361, R356 and D92.

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