# 2nd QUARTERLY PROGRESS REPORT

Jan 1, 2017 to March 30, 2017

**PROJECT TITLE:** Novel Geotextile Mat Tailored to Reduce Odor Emission (H2S) from Landfills

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**COMPLETION DATE: September 30, 2017** **PHONE NUMBER: 352-846-1039**

**PROJECT WEB SITE: https://faculty.eng.ufl.edu/david-mazyck/hinkley_center_project/**

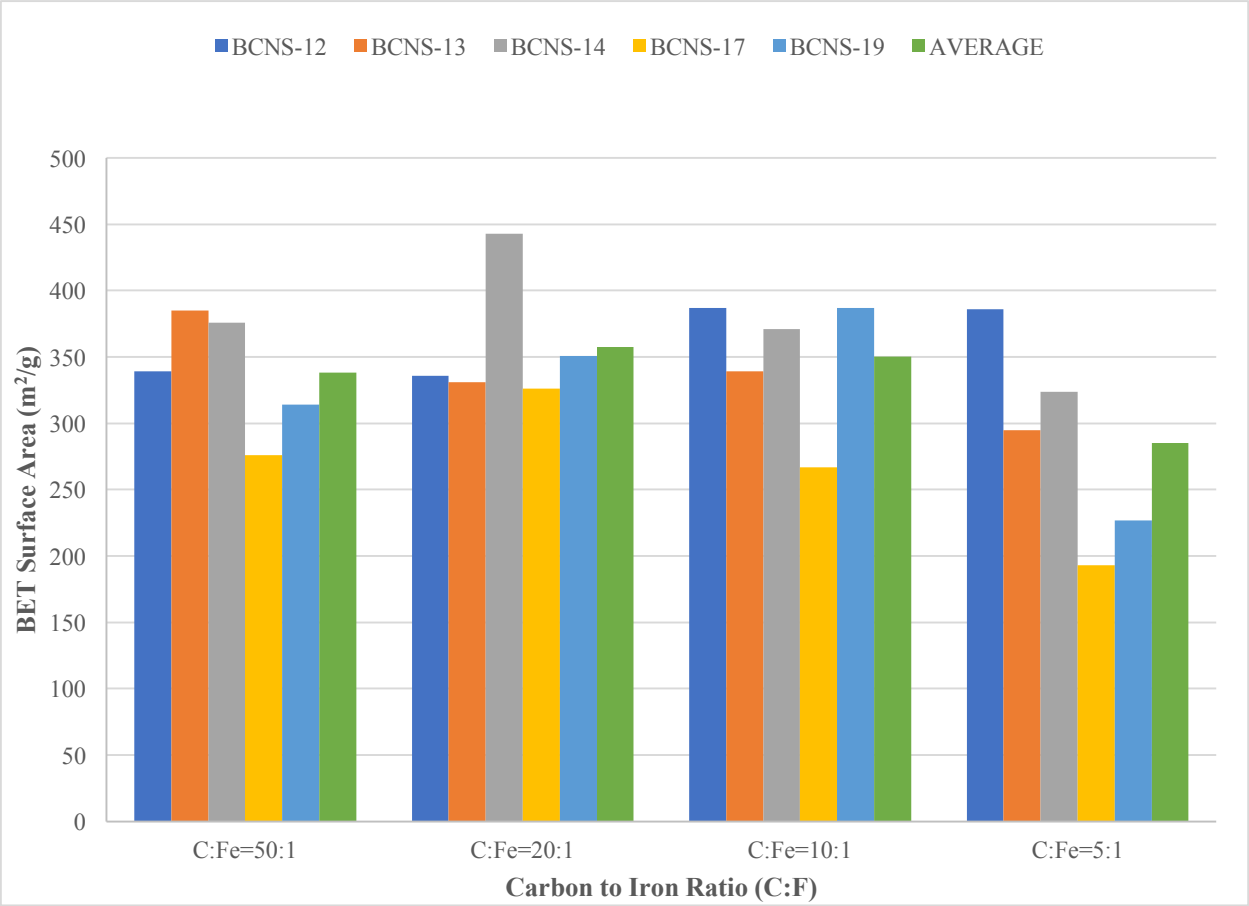
**Work accomplished during this reporting period:**
*The work proposed by quarter is shown in Table 1. The project is on-time and all sample production is completed. Furthermore, the characterization of these samples is initiated and the various produced samples and their characterizations results are shown in Table 2. We are pleased with the produced samples and hypothesize that the total surface area and average pore size for the materials are well suited for H2S adsorption.*

*Table 1. Tasks per month for project*

| **Task Month** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Project Management | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Sample Production | ■ | ■ | ■ | | | | | | | | | |
| Sample Characterization | | | ■ | ■ | | | | | | | | |
| $H_2S$ Testing | | | | | ■ | ■ | ■ | ■ | | | | |
| Mechanism Analysis | | | | | | | | | ■ | ■ | ■ | |
| Project Reporting and TAG Meetings | | | | | | ■ | | | | | | ■ |

*Samples Characterizations*

**BET Results:**




**SEM Results:**

Major differences in the surface morphology of FeACs synthesized from iron-precipitation was characterized by SEM. For the $AC_{Virgin}$, external surface heterogeneities were generated during carbonization (Fig. 1). FeAC-1 has a smooth exterior surface morphology (Fig. 2). Outward appearance became smoother when the C:Fe mass ratio decreased from 50:1 to 20:1 (Fig. 3); inversely, for FeAC-3, its external surface has become motley again because the iron salts broke down the iron coat structure on the carbon (Fig. 4). However, for FeAC-4, although the iron salts destroyed the coat structure, the carbon has been covered by iron salts due to more iron salts during the production. Therefore, the exterior surface was more flattened than FeAC-3 but still unorganized (Fig. 5).

(Due to file size limitation, images were removed from this file. Please email DMazyck@UFL.edu or Reggie17r@UFL.edu for the complete file)

Figure 1. $AC_{Virgin}$ surface structure
Figure 2. FeAC-1 surface structure
Figure 3. FeAC-2 surface structure
Figure 4. FeAC-3 surface structure
Figure 5. FeAC-4 surface structure

### 3.2.1 Effect on FeACs surface

The results of EDS microanalysis of $AC_{Virgin}$ and the composites prepared using various C:Fe mass ratios consisted in the observation of the surface of iron and oxygen are presented in Figure 6 to Figure 10. Figure 6 provides quantitative information on the elements of the $AC_{Virgin}$. FeAC-1 (Fig. 7) and FeAC-3 (Fig. 9) have less iron and oxygen compared with $AC_{Virgin}$. On the contrary, the existence of iron and oxygen increased significantly after precipitation with C:Fe mass ratio of 20:1 and 5:1. Figure 3-8 and Figure 10 showed that each of the samples apparently contained more iron and oxygen on the carbon surface. It is demonstrated that when precipitated with C:Fe mass ratio of 10:1, the high concentration of iron salts destroyed the coating and caused the iron salts to not attach onto the carbon surface well; thus, proving that the iron and oxygen composition was the lowest between those samples. Moreover, when the concentration of iron salts was extremely high, it started covering the surface again, increasing iron and oxygen once more (Fig. 10).

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Figure 6. Element composition obtained by EDS microanalysis of $AC_{Virgin}$ sample
Figure 7. Element composition obtained by EDS microanalysis of FeAC-1
Figure 8. Element composition obtained by EDS microanalysis of FeAC-2
Figure 9. Element composition obtained by EDS microanalysis of FeAC-3
Figure 10. Element composition obtained by EDS microanalysis of FeAC-4

**H2S test stand was built and calibrated with 450PPM of H2S gas.**

Figure 11: $H_2S$ experimental apparatus

**Work planned for the next reporting period:**

*The plan for Q3 is focus on H2S uptake measurements with the samples produced.*

**Metrics:**

| Name | Rank | Department | Professor | Institution |
|---|---|---|---|---|
| Morgan Hull | Undergraduate Student | Environmental Engineering | Mazyck | University of Florida |
| Rachel Liu | Master Student | Environmental Engineering | Mazyck | University of Florida |
| Regina Rodriguez | PhD Student | Environmental Engineering | Mazyck | University of Florida |

*The work has been accepted for publication at the AWMA (Air and Waste Management Association) conference for June 2017. We have applied for further student support for Morgan Hull through the University of Florida University Scholars Program.*

**Stakeholder Working Group Meeting:** The research team began preparation for the first stakeholder working group meeting which is currently being scheduled in March 2017.