Research Thrust-3: Additive Manufacturing for ISRU

Sub-project-3: Synergistic roles of recoverable in-situ materials to support human life off Earth

Statement of R&D Problem

• As spaceflight missions grow longer and more complex, the challenge of storing enough food grows as well. While fruits and vegetables can be brought on board to supplement pre-packaged foods, they get spoiled within the first days of the mission. New solutions must be investigated to supply growing food demand to support life off earth for extended periods with ability to address increased pressure on its air quality control, water treatment/recovery as waste management/treatment.

Statement of R&D Problem

• This project will utilize the synergistic roles of materials (e.g. struvite, chitosan, activated carbon, biochar, zeolite, silica gel and palladium) for enhancing air quality control, water recovery and waste treatment for sustainable food production to support human life off Earth. The effects of microgravity on plant physiology and fish growth, microgravity on fluid flow, effects of radiation levels, effects of pressures, reusability of water that has gone through the UPA and the WPA and treated with biocide are minimally known. Furthermore, crew comfort and health also depend on the proper mix of atmospheric gases and humidity.