Memorandum For Record

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Sr. Air Safety Investigator
Eastern Region

Date: 10/24/2023
NTSB Accident Number: ERA23FA067

Several small pieces of contamination (Figures 1, 2, and 3) found in the regulator section of the right servo fuel injector were removed, and shipped on February 21, 2023 via UPS 2nd Day Air ZA3978T0290805398 to the NTSB Materials Laboratory for examination. It was received on February 24, 2023.

According to an e-mail report from the NTSB Senior Chemist, "A piece of each type of material was examined using a Fourier Transform Infrared (FTIR) spectrometer with a diamond attenuated total reflectance (ATR) accessory in accordance to ASTM E1252-98 (American Society for Testing Materials E1252-98: *Standard Practice for General Techniques for Obtaining Infrared Spectra for Qualitative Analysis and American Society for Testing Materials*). The spectrometer was used to collect and process infrared wavelength absorbance spectra of the unknown material(s).

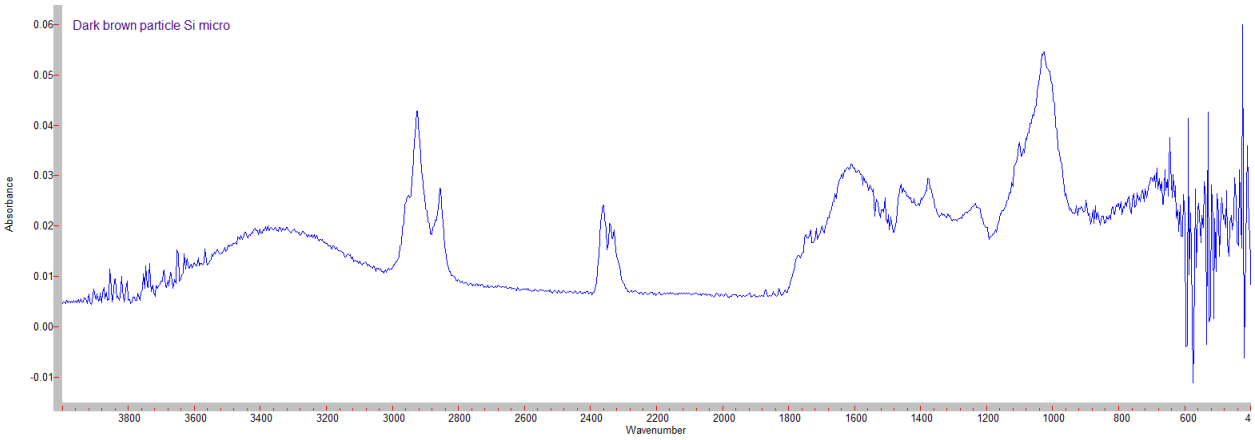
The spectrum for each type were very similar to one another indicating that the two types of materials found were likely the same material. The sample spectra contained the following combination of spectral peaks corresponding to particular functional groups found within molecular structure of the material. The presence of a strong doublet peak between ~2920 $cm^{-1}$and ~2850 cm^{-1} is indicative of a carbon-hydrogen (C-H) single stretching bond. The presence of a doublet peak ~2360 and 2340 cm^{-1} is indicative of a carbon-carbon (C-C) group (most likely in the form of elemental carbon or carbon black). It can also indicate the presence of a triple bonded carbon-nitrogen (C≡N) group. The presence of a single broad peak ~1600 cm^{-1} is indicative of a carbonyl (oxygen-carbon-oxygen (O-C=O)) stretching bond. The presence of a single peak ~1460 cm^{-1} is indicative of a carbon-hydrogen$_2$ ($C-H_2$) bending bond. The presence of peaks ~1370cm^{-1} and ~1230cm^{-1} are indicative of carbon-hydrogen$_2$ ($C-H_2$) deformation bonds. The presence of a single peak ~1030cm^{-1} is indicative of a carbon-oxygen (C-O) stretching bond. This combination of functional groups is consistent with a straight-chained

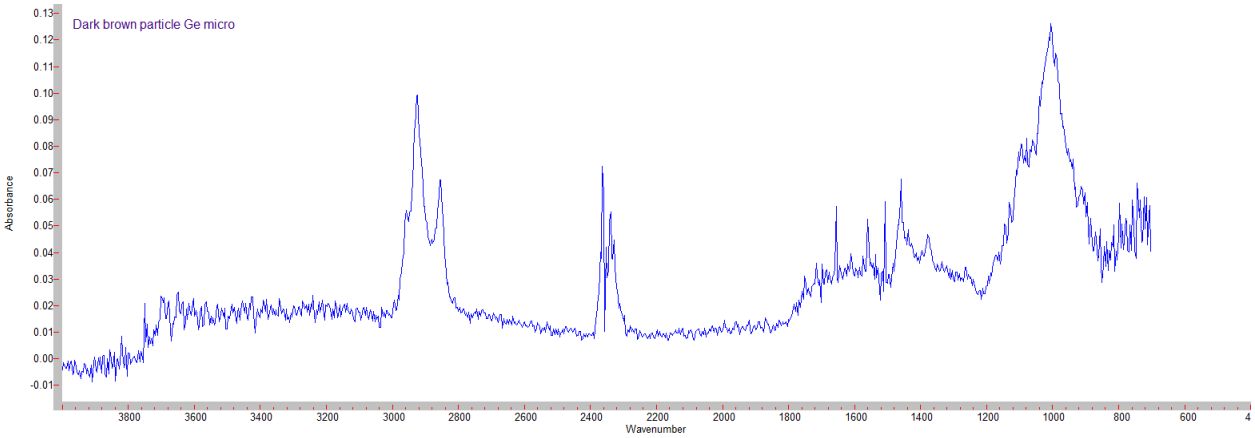
hydrocarbon with an attached nitrile group. A spectral library search was performed on unknown spectrum. The search found a match to acrylonitrile-butadiene-styrene (ABS), a thermoplastic."

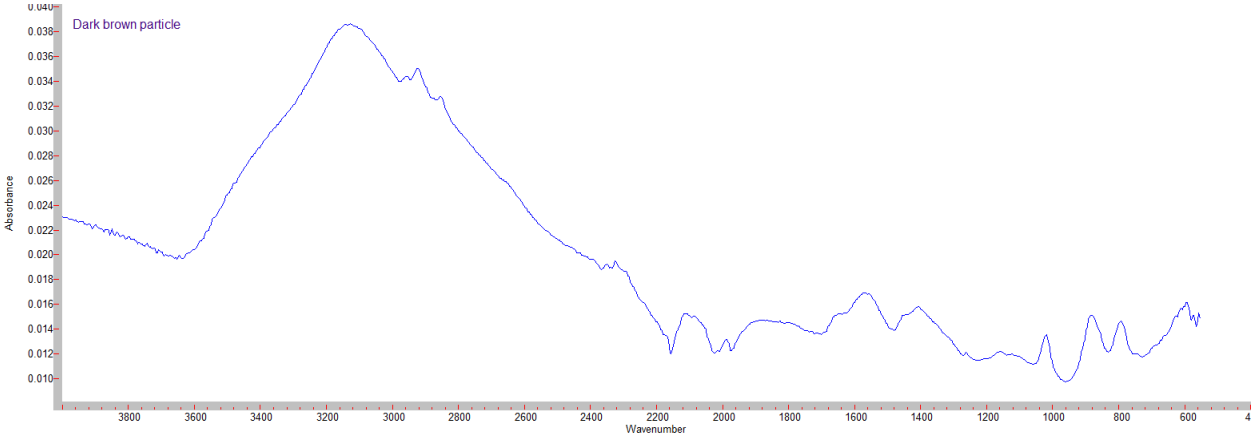
Figure 1: NTSB Digital Photograph. View of Black Particle with Scale.

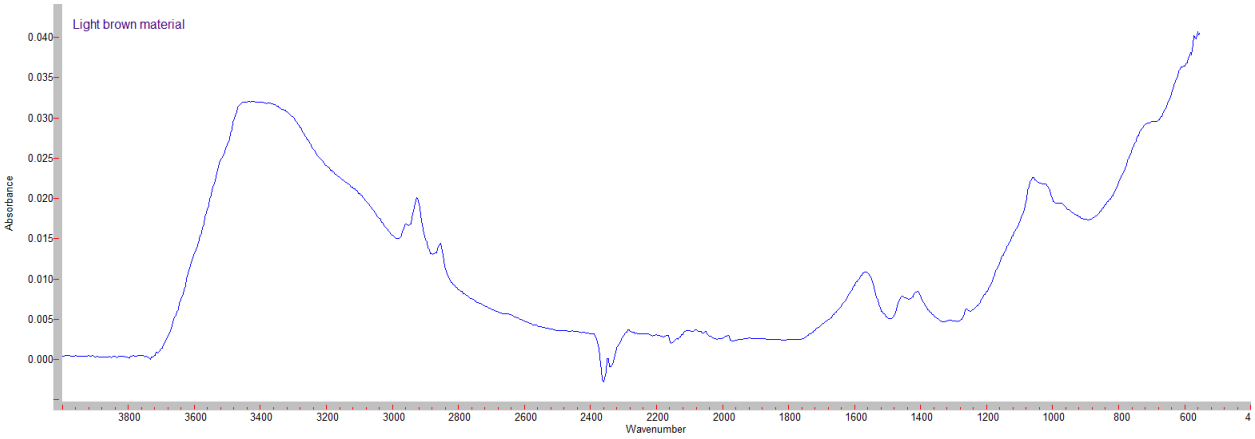
Figure 2: NTSB Digital Photograph. View of Light Brown Particle with Scale.

Figure 3: NTSB Digital Photograph. View of Both Pieces of Contamination With Scale.


Dark brown particle Si micro
Absorbance
Wavenumber


Dark brown particle Ge micro
Absorbance
Wavenumber


Dark brown particle
Absorbance
Wavenumber


Light brown material
Absorbance
Wavenumber