**Possible interpretations and implications of the carbons detection in Martian meteorite Zagami.** B. L. Nascimento-Dias[1]; V. C. dos Anjos[1], M. E. Zucolotto[2], T. V. F. da Silva[3], J. Barreto[4] and F. Stavale[4]. Department of Physics, Federal University of Juiz de Fora[1], PPGF, Brazil[1], Department of Geoscience, National Museum of Rio de Janeiro[2] , Department of Chemistry, Federal University of Juiz de Fora[3], Brazil, Physics, Brazilian Center for Physical Research[4], Brazil. (bruno.astrobio@gmail.com)

**Introduction:**
Martian meteorites are considered important pieces of geological material from Mars. Among meteorites from Mars, Zagami is a very famous shergottite, well characterized and studied. Some of these studies detected organic compounds in the Zagami meteorite and was recorded in some articles [1]. Thus, based on analysis carbon results detected in the Zagami, will be suggested here some possible interpretation about the origin of this carbon and implications.

**Methodology:**
Fourier transform infrared (FTIR) spectrometer was used (Alpha II, Bruker Optics, Ettlingen, Germany). The spectra of the sample were collected under environmental conditions in the range between 4000-400 $cm^{-1}$ , with a resolution of 4 $cm^{-1}$ and acquiring an average of 128 scans. In addition, Hyperion 3000-VORTEX 70 was used. This equipment has a diamond attenuated total reflectance (ATR) accessory and OPUS software (v. 6.5, Bruker Optics) was used for instrumental control and for spectral acquisition. In addition, multi-elementary data were collected using XPS. The acquisition of data was obtained through a regime called ultra high vacuum (UHV), which is possible to reach a vacuum level of up to $10^{-10}$ mbar.

**Results**:
Using FTIR was detected bands in the higher wavelength region at 1642, 1742, 2850, 2920 and 3455 $cm^{-1}$ and lower wavelength region at 500, 635, 672, 725, 880, 936, 962, 1050, 1344 and 1400 $cm^{-1}$ in Martian meteorite Zagami (Fig. 1). Through XPS was obtained a multi-elemental analysis of the surface of the Martian meteorite (Fig.2) which Fe 2p, Cu 2p, Mg KLL, Ca 2p, Si 2p, C 1s e O 1s peaks were detected.

**Discussion:**
Based on the results obtained by both techniques, the presence of carbon on the surface of the Zagami was detected by XPS. According to the analyzed XPS data (Fig. 3), carbon seems to have different origins (endogenous and exogenous), but C 1s are composed of CC and / or C = O, O1s composed of MOx (M can be any metal) and C = O. The interpretations were made from the high resolution spectrum of the Carbon peak (Fig. 4). It is important to emphasize that this is not the first study of carbon in a Martian meteorite. Some analyses measuring negative C isotope values in SNC meteorites have already been carried out, and for example, the Zagami δ13C was recorded: −34% [2]. In addition, the results obtained by FTIR call attention because the presence of aliphatic hydrocarbons was detected [3]. The band 2920 $cm^{-1}$, referring to the vibrational mode of aliphatic hydrocarbons has also been reported in previous research in Fig. 5 by other research groups [4]. This reinforces the results that have been generated here. Finally, it is worth mentioning that in the Zagami meteorite itself, $CO_2$ trapped in some glassy regions has already been found [5].

**Conclusions:**
In conclusion, the possibility of some kind of contamination should never be ruled out completely. However, all handling and vacuum cleaning of the sample before measurements were performed. Thus, it does not seem impracticable that the carbon detected by both techniques can be endogenous material from Mars. However, more techniques need to be used in a complementary way so that the origin of the detected carbon and aliphatic hydrocarbon is more accurately attributed. Finally, One of the current goals of Martian exploration is to find evidence for extinct (or even extant) life. Carbon (an essential ingredient of life on Earth) is known to occur on Mars as $CO_2$ in the atmosphere and frozen in the polar caps; it is inferred to be present as carbonates in the Martian crust and soils (maybe microbialites). Thus, data and information like this can motivate greater incentives for research and resources for other future missions such as Perseverance.

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**Reference** [1] Palomba, E., et al (2006). *Icarus*, 182(1), 68-79. [2] Wright et al (1992). GCA, 56(2), 817-826. [3] do Nascimento-Dias, B. L., et al, (2020). IJA, 19(6), 438-445. [4] Anderson, M. S., et al (2005). RSI, 76(3), 034101. [5] Wright, I. et al (1992). LPS XXIII (Vol. 23).

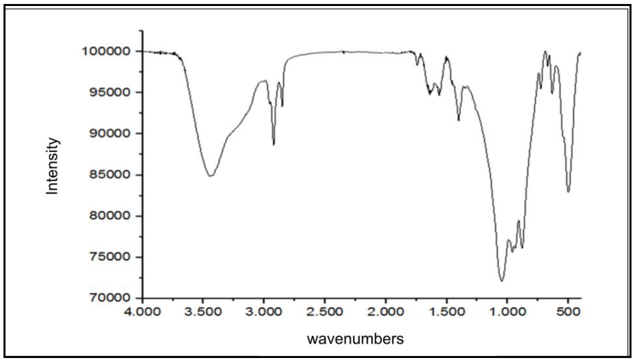


Figure 1- FTIR Spectrum of Zagami

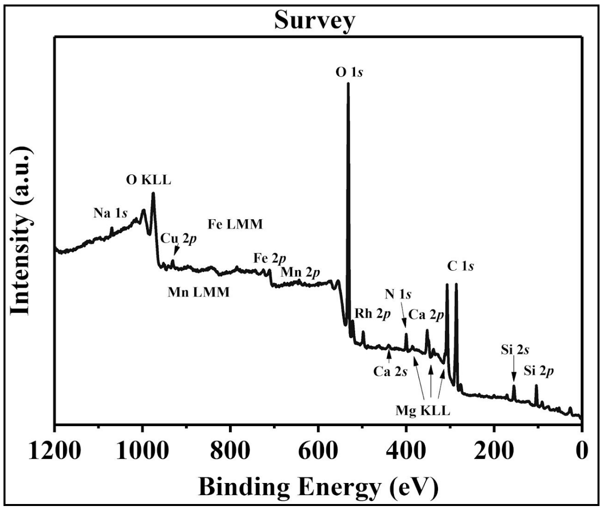


Figure 2- XPS Spectrum of Zagami

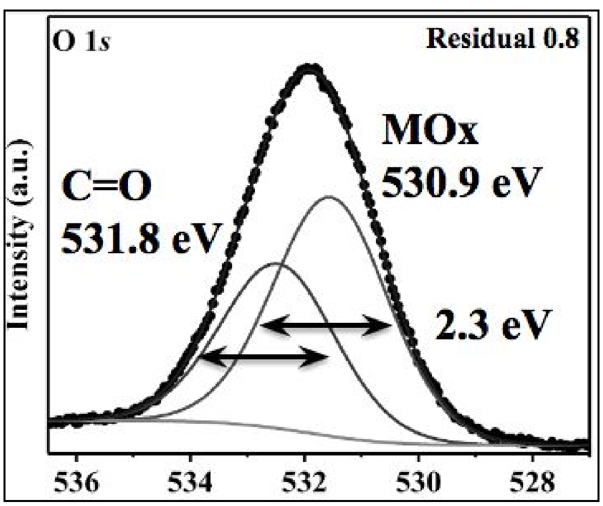


Figure 3- High Resolution Spectra of Carbon and Oxygen from Zagami

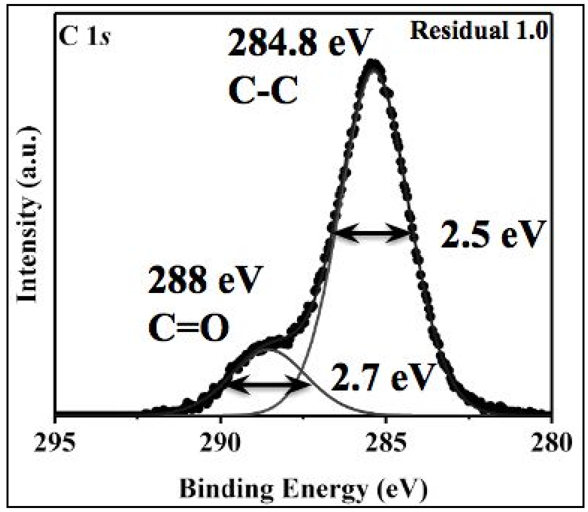


Figure 4- High Resolution Spectra of Carbon from Zagami

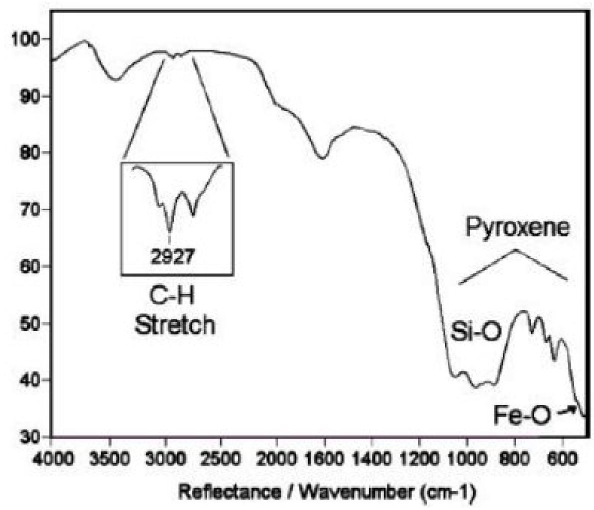


Figure 5- The infrared spectrum of the Zagami Mars meteorite readily shows the presence of aliphatic hydrocarbon by Anderson et al. (2005).