THE EFFECT OF MONOATOMIC OXYGEN ON CARBON-SPUTTERED QUARTZ CRYSTALS

Eivydas Trioška[1], Mindaugas Viliūnas[2], Greta Merkininkaitė[1], Simas Šakirzanovas[1]

[1]Institute of Chemistry, Vilnius University, Naugarduko 24, LT-03225, Vilnius, Lithuania
[2]Institute of Chemical Physics, Vilnius University, Saulėtekio 9, LT-10222 Vilnius, Lithuania
eivydas.trioska@chgf.stud.vu.lt

Atomic oxygen (AO), a predominant form of oxygen in outer space, offers an effective and minimally invasive way to remove carbon-based contaminants from various surfaces without health and environmental concerns. The efficiency of AO cleaning was estimated using a Quartz Crystal Microbalance (QCM) sensor, carbon-sputtered 6 MHz quartz crystals and a K-type thermocouple, while AO was introduced with a plasma generator.

The experimental procedure is depicted in Figure 1. Step 1: initial mass and ambient temperature measurements (m_1 = -0.032 μg/cm^2, t_1 = 22.3 °C) over a 4-minute period. Step 2: mass change and temperature measurements (m_2 = 0.226 μg/cm^2, t_2 = 20.0 °C) during an 8-minute period with gas flow (without plasma). Step 3: highest instantaneous mass change and temperature measurements (m_3 = -50.663 μg/cm^2, t_3 = 70.5 °C) with plasma for a 4-minute period. Step 5: mass change and temperature measurements (m_4 = -5.985 μg/cm^2, t_4 = 24.4 °C) after a 13-minute cooldown. Results are promising for upcoming measurements, because both instantaneous and long-lasting mass changes are present (m_3 = -50.663 μg/cm^2 and m_4 = -5.985 μg/cm^2 respectively).

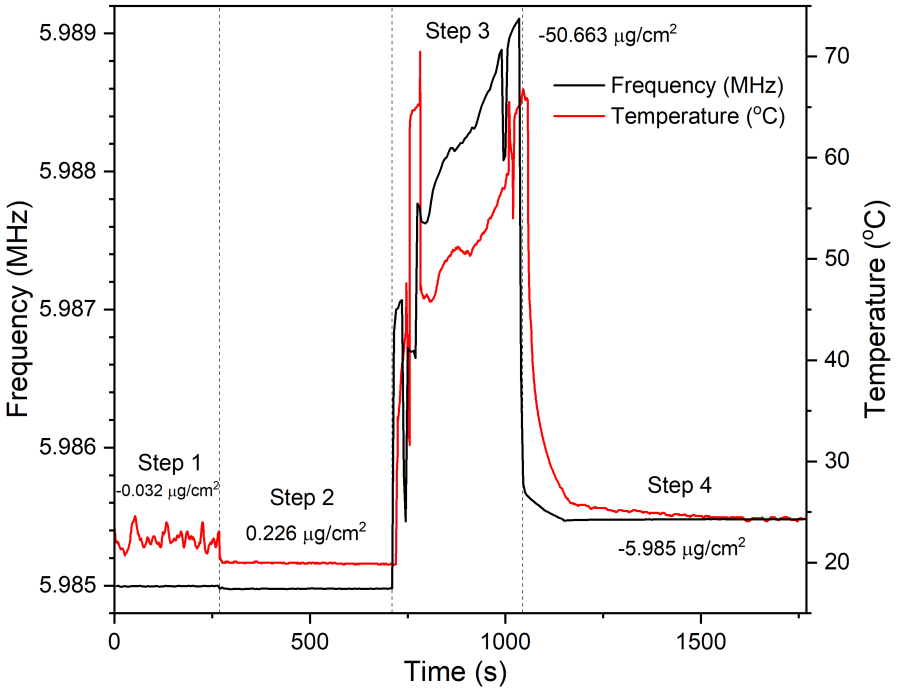

Fig. 1. QCM frequency and temperature relation.

Acknowledgment

The autors acknowledge financial support from the European Research Executive Agency (REA) (Grant Number: 101061336)