



JULY 07, 2020
CONFERENCE
ONLINE

Graphene Online
&2DM

Fundamental Research Insights



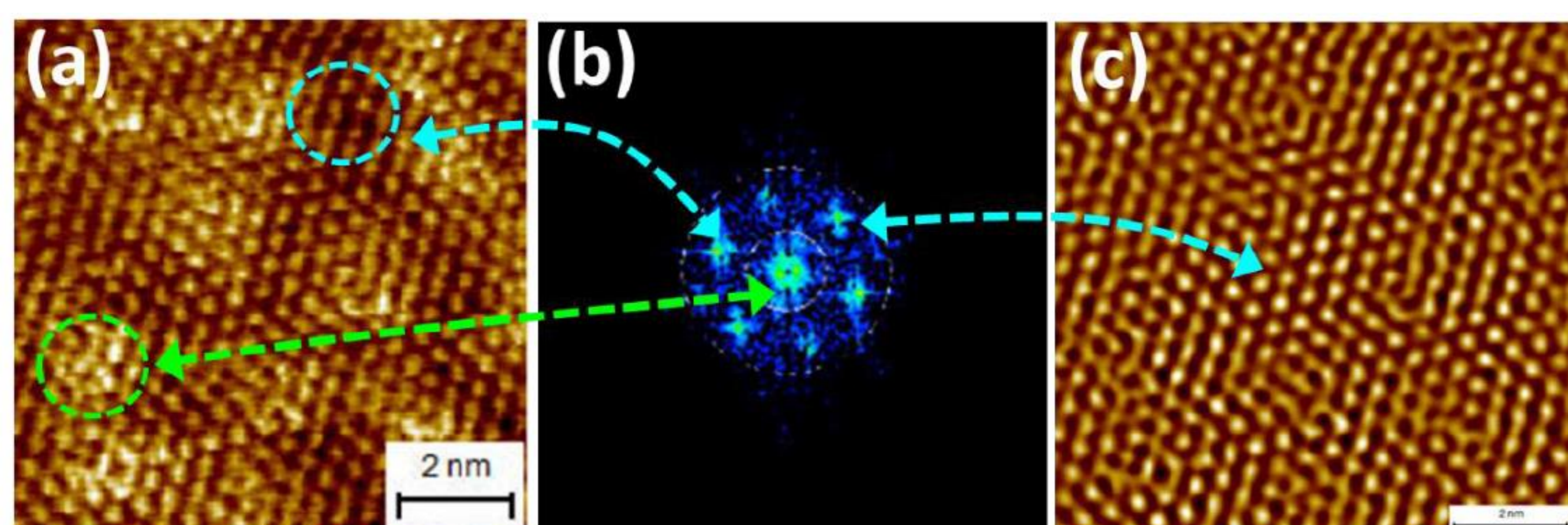
Effective Reduction of Oxygen Debris in Graphene Oxide

Dima Cheskis¹, Orit Seri-Livni^{2,3}, Cecile Saguy², Faris Horani^{2,3}, Efrat Lifshitz^{2,3}

1. Physics Department Ariel University, Ariel 407000, Israel; 2. Solid State Institute, Technion, Haifa, 3200003, Israel; 3. Schulich Faculty of Chemistry, Technion, Haifa, 3200003, Israel

Abstract Graphene oxide (GO) has unique properties including electronic energy band-gap, hydrophilic behavior and numerous anchoring sites required for functionalization. However, the presence of numerous clusters containing oxygen functional groups (called debris). Here, we present a simple method consists of minimal treatments, like sonication and/or water rinsing processes, aimed to reduce the density of oxygen debris. Whereas this simple method removed epoxy and hydroxyl oxygen groups weakly attached to the graphene matrix, the double C=O bonds are almost not affected by the applied treatment, as demonstrated by X-ray photoelectron spectroscopy (XPS) and Fourier-Transform Infrared Spectroscopy (FTIR). A non-uniform distribution of the oxidation sites was observed, some appearing as clusters concentrated preferentially on GO defected regions, which are separated by pristine graphene area as seen by scanning tunneling microscopy and high-resolution transmission electron (STM).

STM measurements of Multilayer GO before sonication and water rinsing treatment

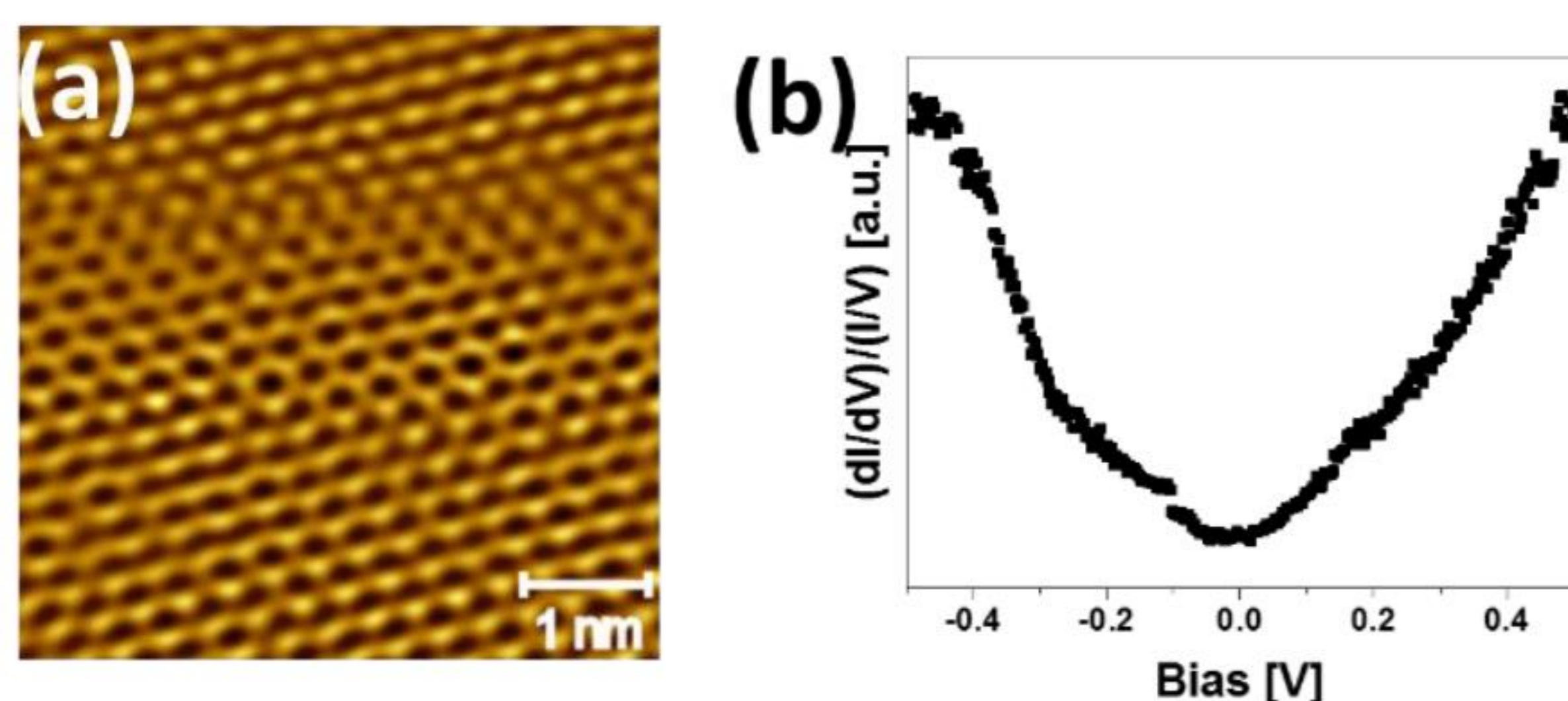


Characterization of the as-purchased GO multilayer samples: (a) A STM image; (b) Fourier transform of image in (a), showing two distinct regions: An inner part at low frequency, corresponding to a distorted region as framed by a green line in (b); An outer-ring at a higher frequency, related to the "graphenic" region marked by blue-line in (a). (c) Inverse Fourier transform image considering only the higher frequencies in (b).

Effective Reduction Process



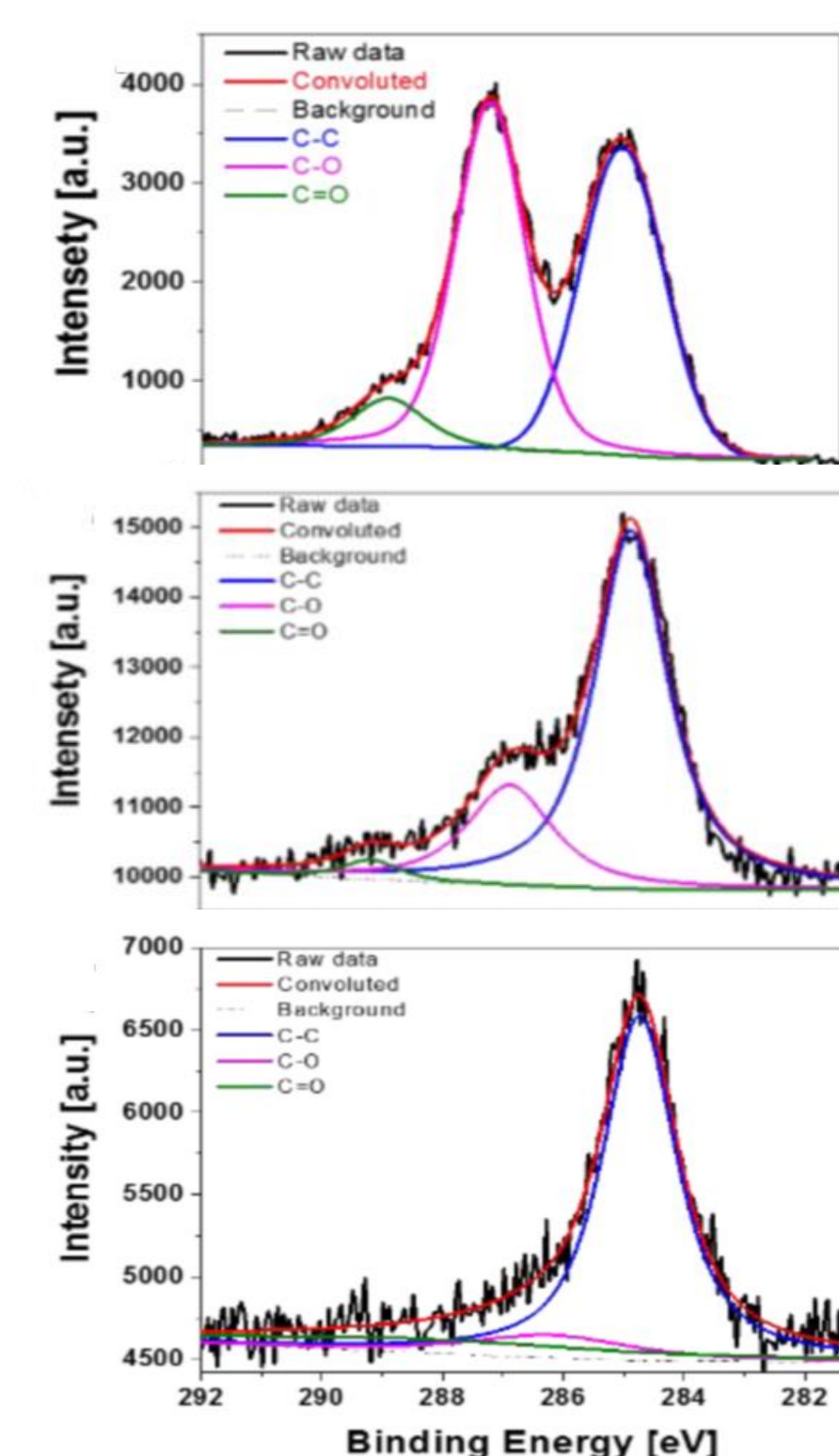
STM Measurements after reduction



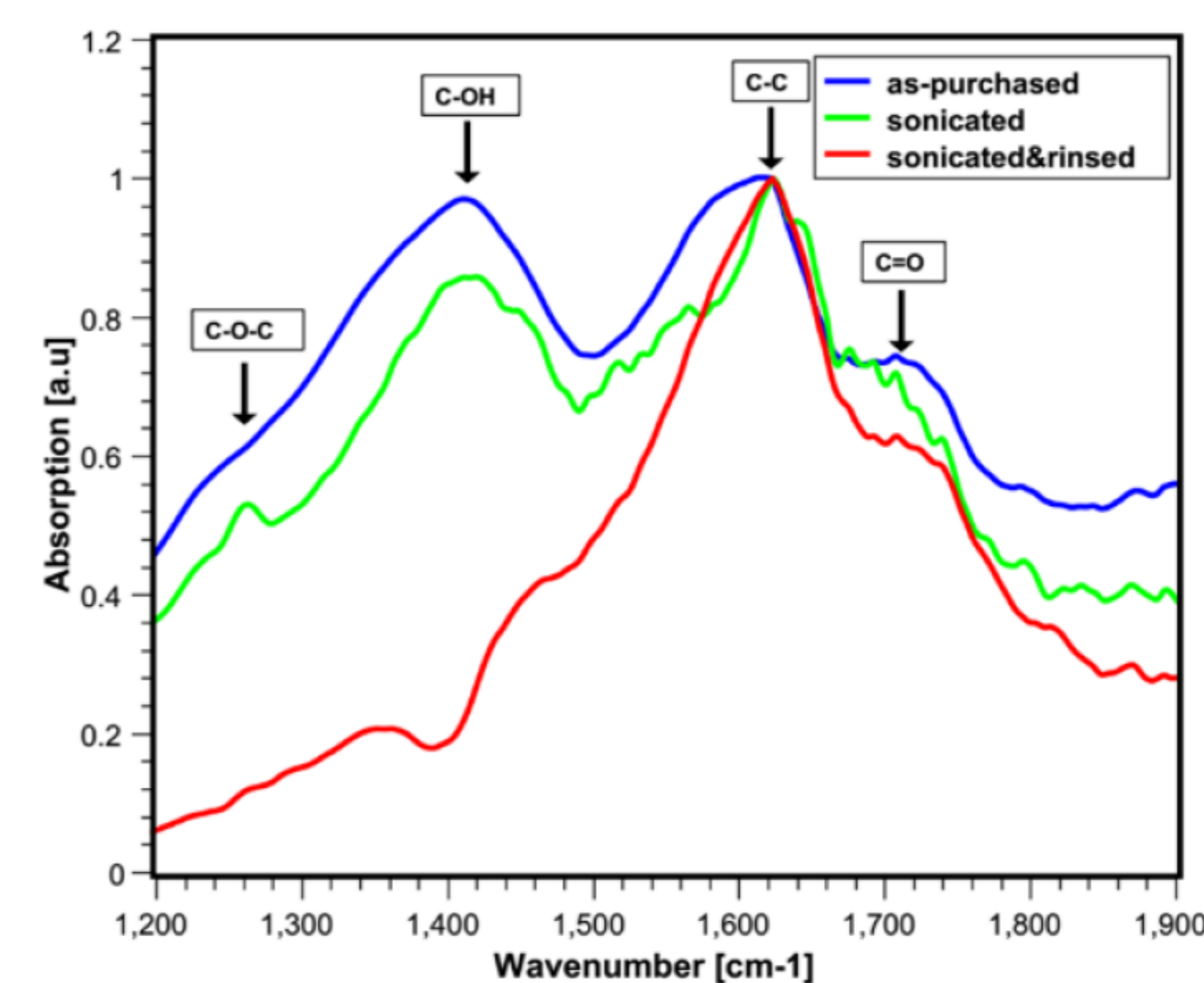
(a) STM topography image of single layer and (b) STS curve from image (a).

XPS GO measurements in all steps

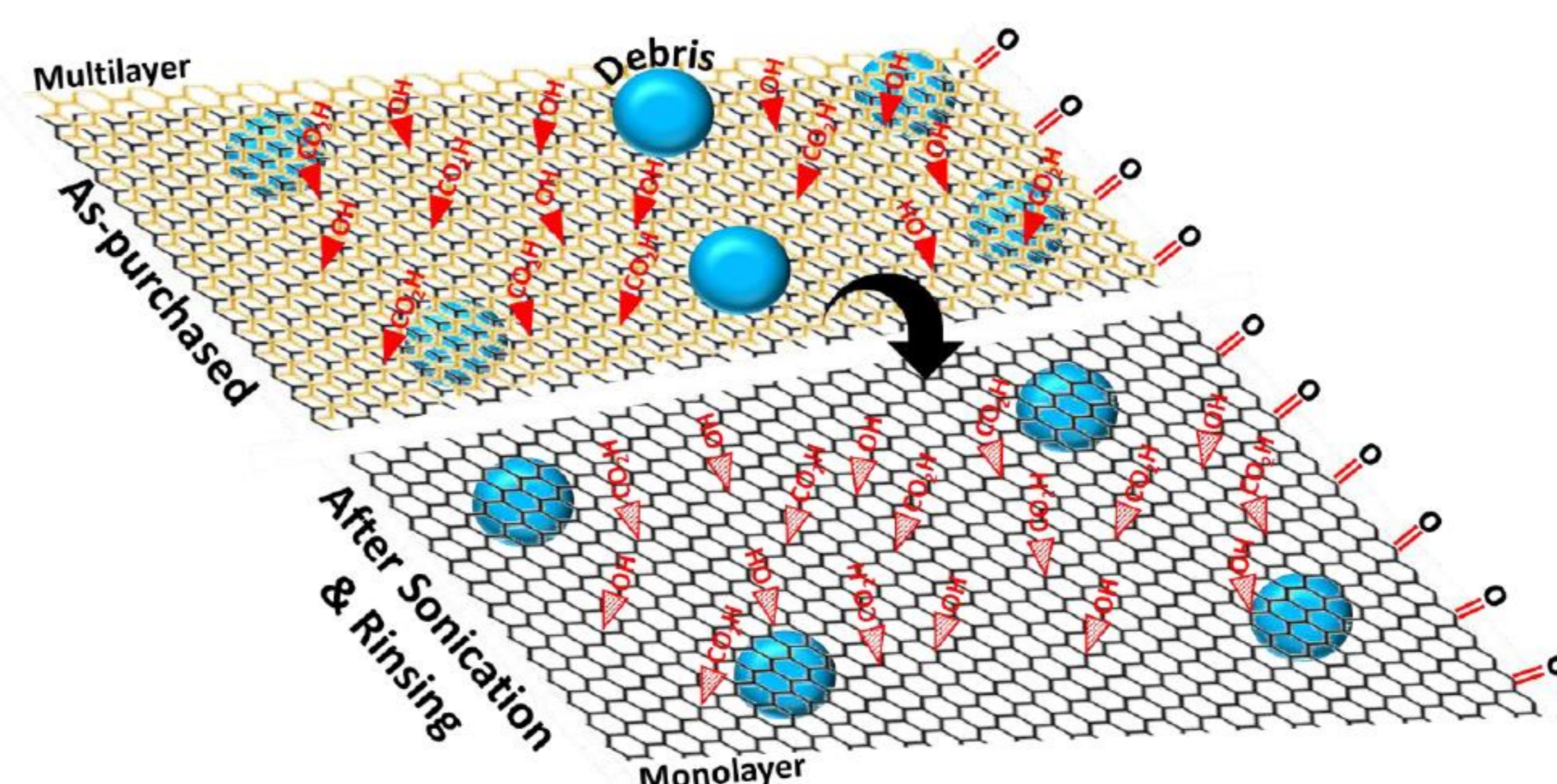
Process	Description	C-C [%]	C-O [%]	C=O [%]	C/O ratio
(i)	As purchased	47.08	46.19	6.73	0.89
(ii)	Sonicated	70.60	20.45	8.95	2.40
(iii)	Sonicated and water rinsed	87.19	4.95	7.86	6.81



FTIR GO measurements in all steps



GO effective reduction proposed model



CONTACT PERSON

Dr. Dima Cheskis
dimach@ariel.ac.il



REFERENCES

[1]. Submitted to Carbon Journal, arXiv preprint arXiv:2006:15668

Graphene Online
&2DM
Fundamental Research Insights

