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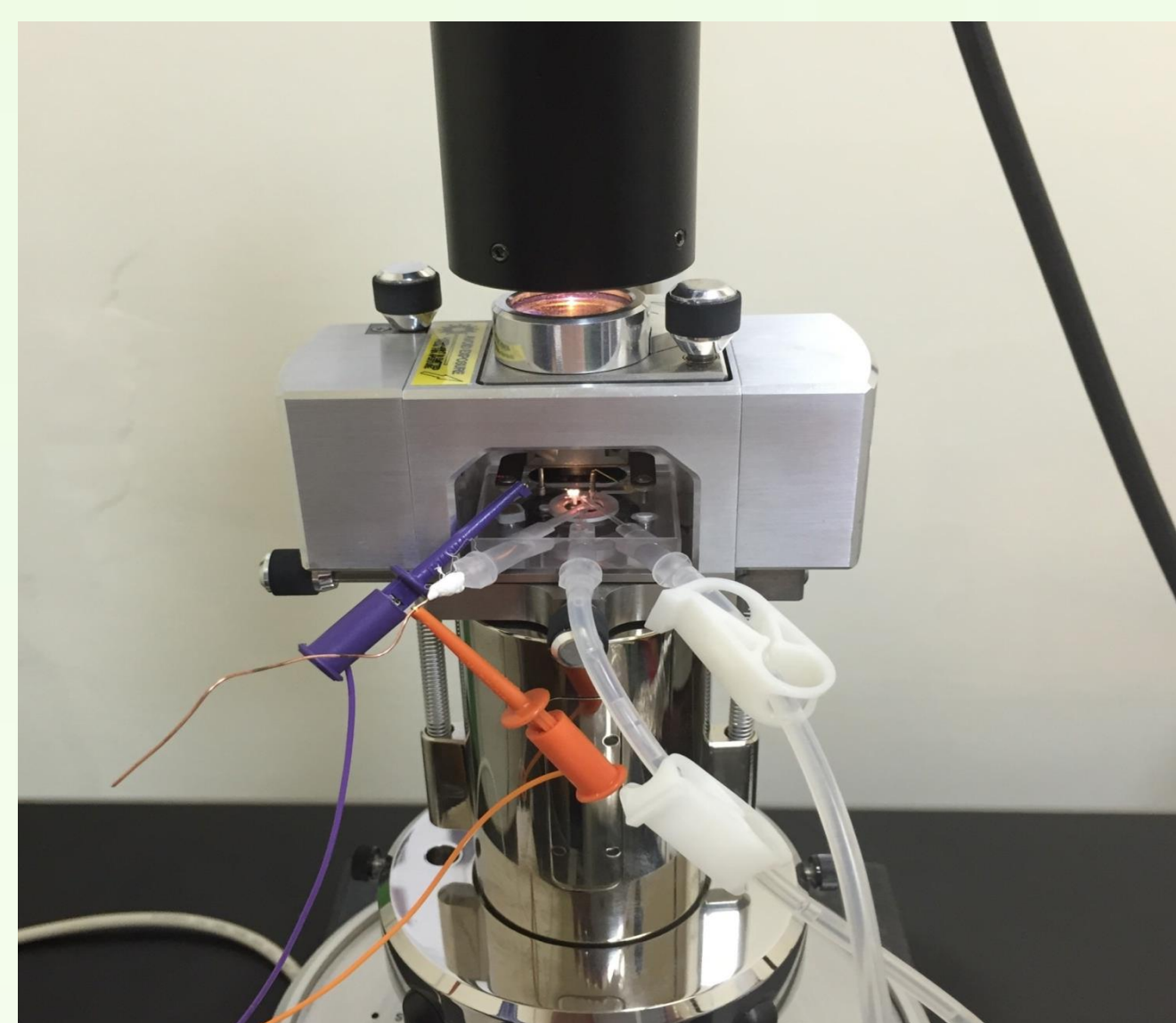
World energy crisis
Why We Need Alternative Energy Resources?

Depletion of fossil fuels and the realities of global warming have inspired mankind to search for renewable power sources than can meet demand for energy in a more sustainable manner.

EXPERIMENTAL :

➤ The electrochemical treatment of previously polished glassy carbon (GC) electrodes was performed by anodic polarization in 0.5 M H₂SO₄ at 2 V during 95 s.

➤ In situ AFM electrochemical technique was employed for direct monitoring of morphological changes of the GC surfaces during the electrochemical treatment, and to study morphological evaluation of platinum catalyst deposited on GC support.



- Platinum black was attached in a form of thin layer onto the polished and electrochemically treated glassy carbon support.
- The catalyst electrocatalytic activity was studied for methanol oxidation reaction in H₂SO₄ solution.
- In order to obtain better activity of platinum catalysts deposited on Vulcan XC support, microwave assisted polyol synthesis method was applied.
- In this procedure, 0.5ml of 0.05M H₂PtCl₆ were mixed with ethylene glycol under magnetic stirring. Then, 0.8M NaOH was added dropwise to adjust pH~12. The prepared solution were placed in the centre of microwave oven and heated 60s at 700w. After microwave heating, the colloidal solutions were mixed with 20 ml of water suspension of Vulcan XC-72 carbon and 150 ml 2M H₂SO₄ for 3 h with magnetic stirring. The suspensions were filtered and solid residues were washed with ultra-pure water dried in N₂ atmosphere at 160°C for 3h. The metal loading was adjusted to ~20 mass %.

Why methanol as a fuel?

Direct methanol fuel cells (DMFCs) are very promising power sources for stationary and portable electric devices due to its high efficiency and low emissions of pollutants, low operating temperature, high energy density, nontoxic and environmentally friendly characteristics

Role of the catalysts support

Catalysts support is essential for nanostructured noble metal catalysts activity and stability since that interaction between the metal particle and the support can affected on metal particle size and dispersion. The function of the support is also to extend the surface area of the metal that is, to enable efficient utilization of metals by providing the maximum ratio of surface area and weight.

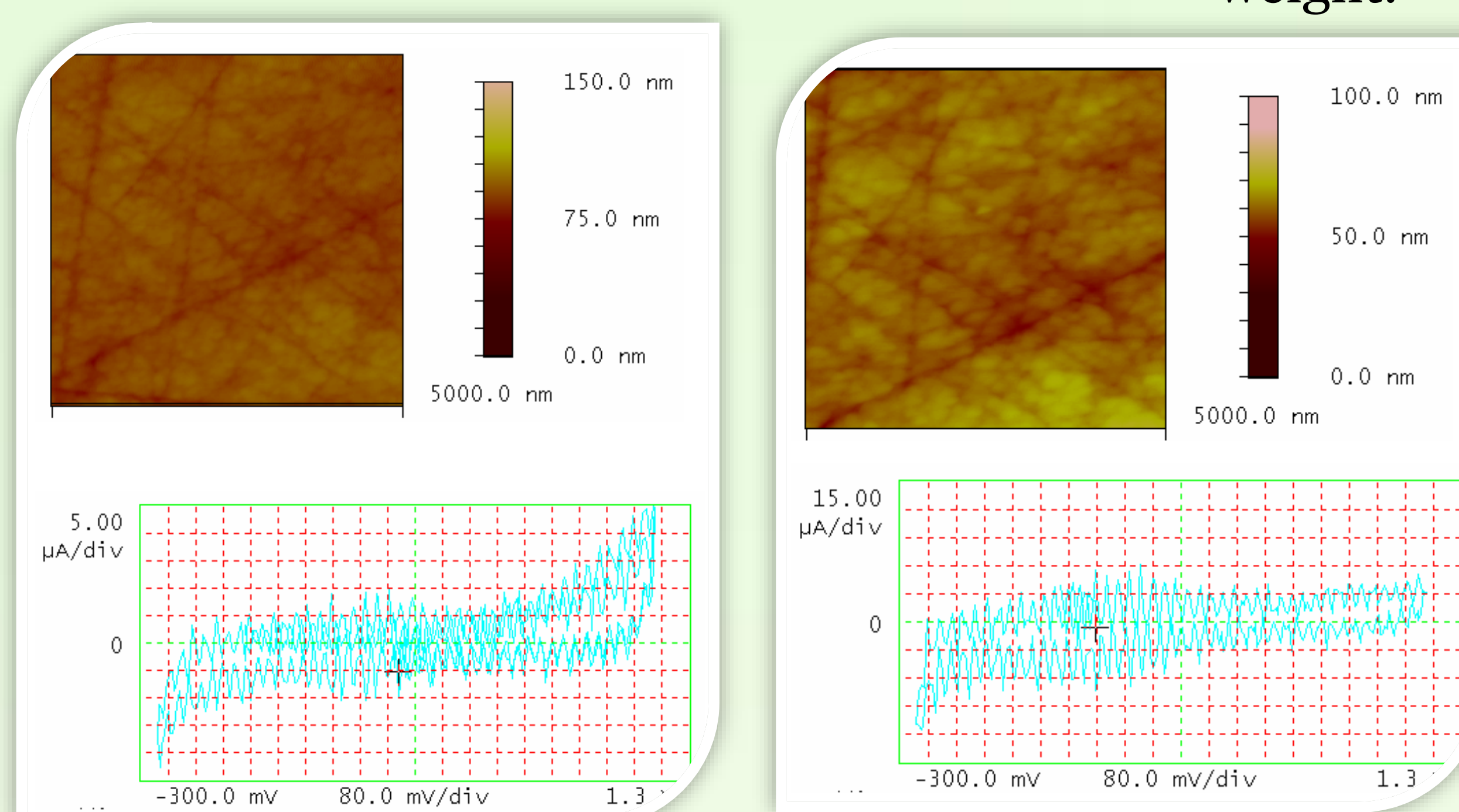


Fig 1. Cyclic voltammograms and image surface of a) polished and b) oxidized glassy carbon electrode

Glassy carbon is porous material that consists of aromatic ribbon molecules randomly oriented. Oxidation of GC leads to formation and growth of oxide layer, causing higher roughness and more defects at the surface.

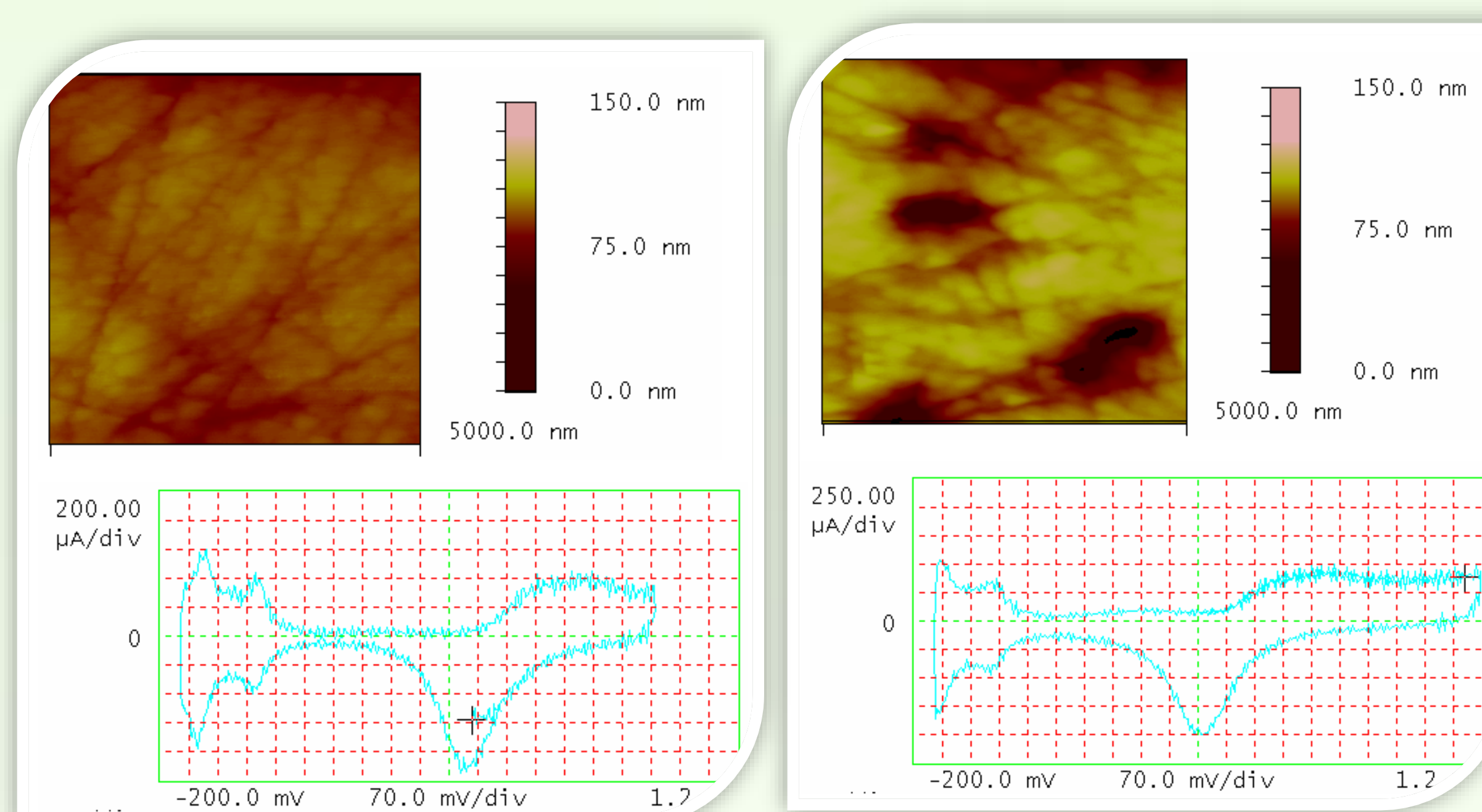


Fig 2. Cyclic voltammograms and image surface of a) GC/Pt_{black} b) GCox/Pt_{black} electrodes

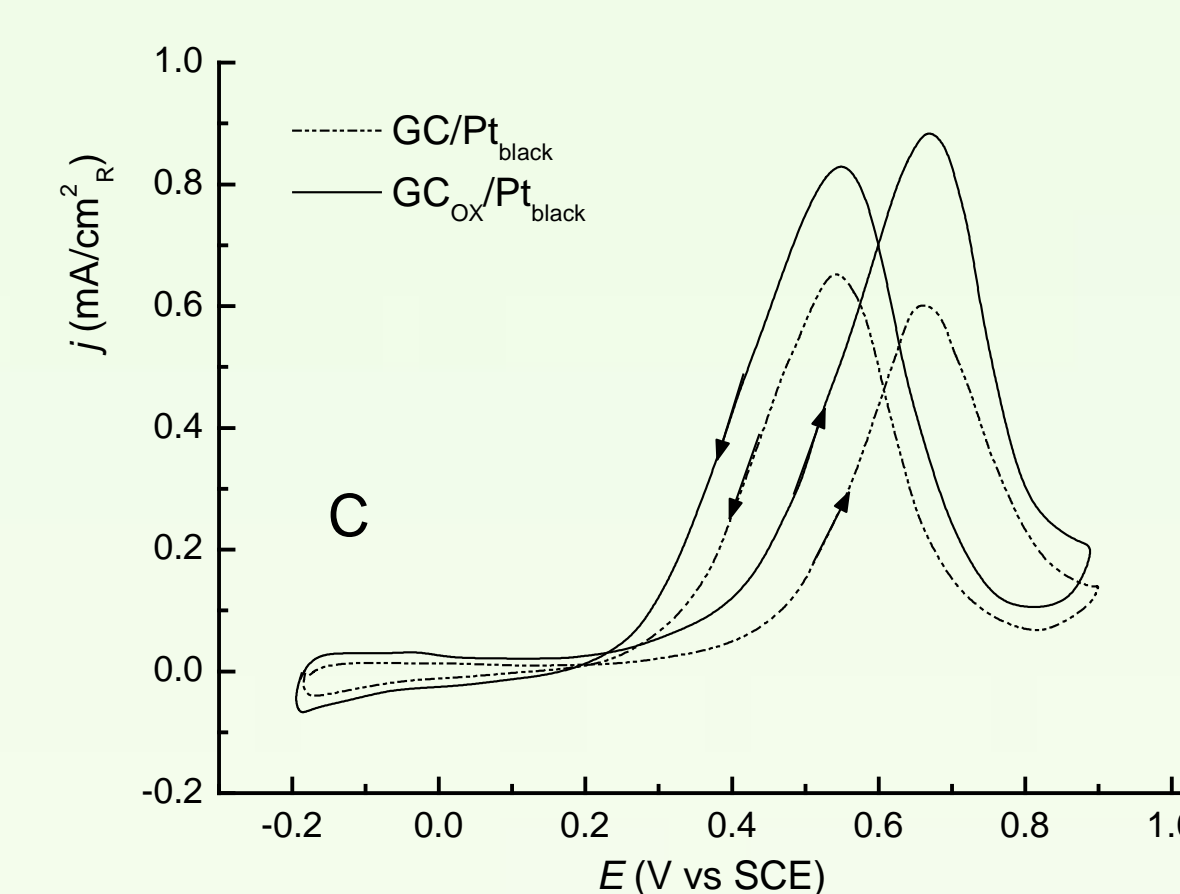


Fig 3. The contribution of GC functional groups to methanol oxidation for GC/Pt_{black} and GCox/Pt_{black} electrodes

AFM analysis of platinum catalysts showing more uniform distribution of larger number of smaller agglomerates at oxidized support in comparison with the polished one. Oxidation of glassy carbon leads to the changes of functional groups. From this reason, metal-support interaction is different and can affect the intrinsic activity of Pt deposits. It can be concluded that the increased activity of GCox/Pt_{black} is due to higher participation of oxygen containing functional groups of the GCox support. This groups promote oxidation of CO_{ads} which is the main poison in methanol oxidation reaction.

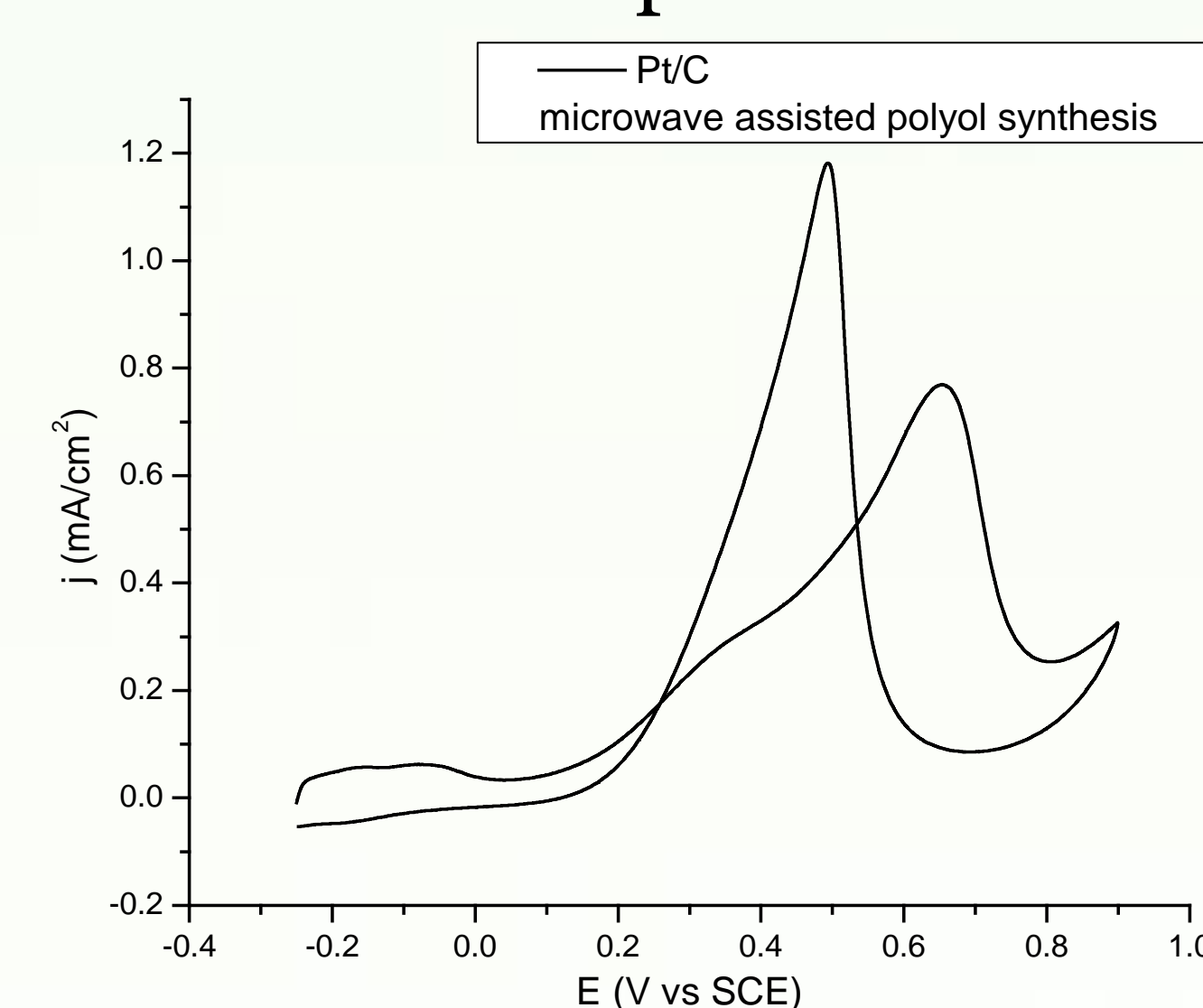
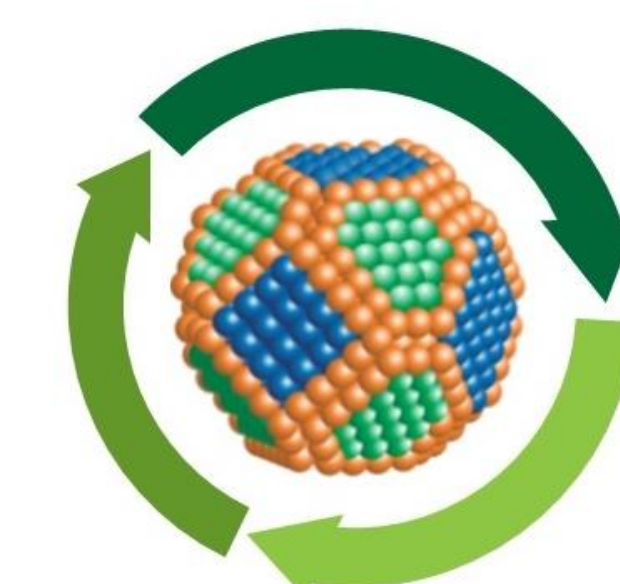


Fig 4. Methanol oxidation for Pt/C electrode

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