

PT-FREE TAILOR-MADE ELECTRODE MATERIALS

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OUR SOLUTION

The authors of invention propose to use carbon-based hybrid materials (as innovative technology of production) as a cathode material in fuel cells, as well as for the construction of supercapacitors, metal-air batteries or photovoltaic cells. The laboratory tests have proven that the obtained material shows very good electrochemical properties.

Other material advantages include:

- synthesis conditions: 600-1000 oC
- **low production cost** (cost below 5 Euro)
- material stability, there is no significant loss of mass of the raw material, which has a positive impact on the profitability of the production of materials
- **large specific surface** (surface area up to 2000 m²/g)
- controllable porous structure
- steerable conductivity
- **high activity** as cathode material for oxygen reduction, better than Pt or Pd-based electrode materials
- number of electrons participating in the ORR reaction is in the range of 2.7-3.8 from the Koutecky-Levich equation

ENTERTING THE NEWS

We suggest taking up work in a completely new, open area, which is the use of hybrid carbon matrixes containing both nitrogen and sulfur heteroatoms as a new **platinum-free** electrode materials to generate electricity in fuel cells, supercapacitors, metal-air batteries and photovoltaic cells. In addition, this material and the method of its preparation (subject of the invention) is environmentally friendly, electrochemically efficient and cheap (cost below 5 Euro).

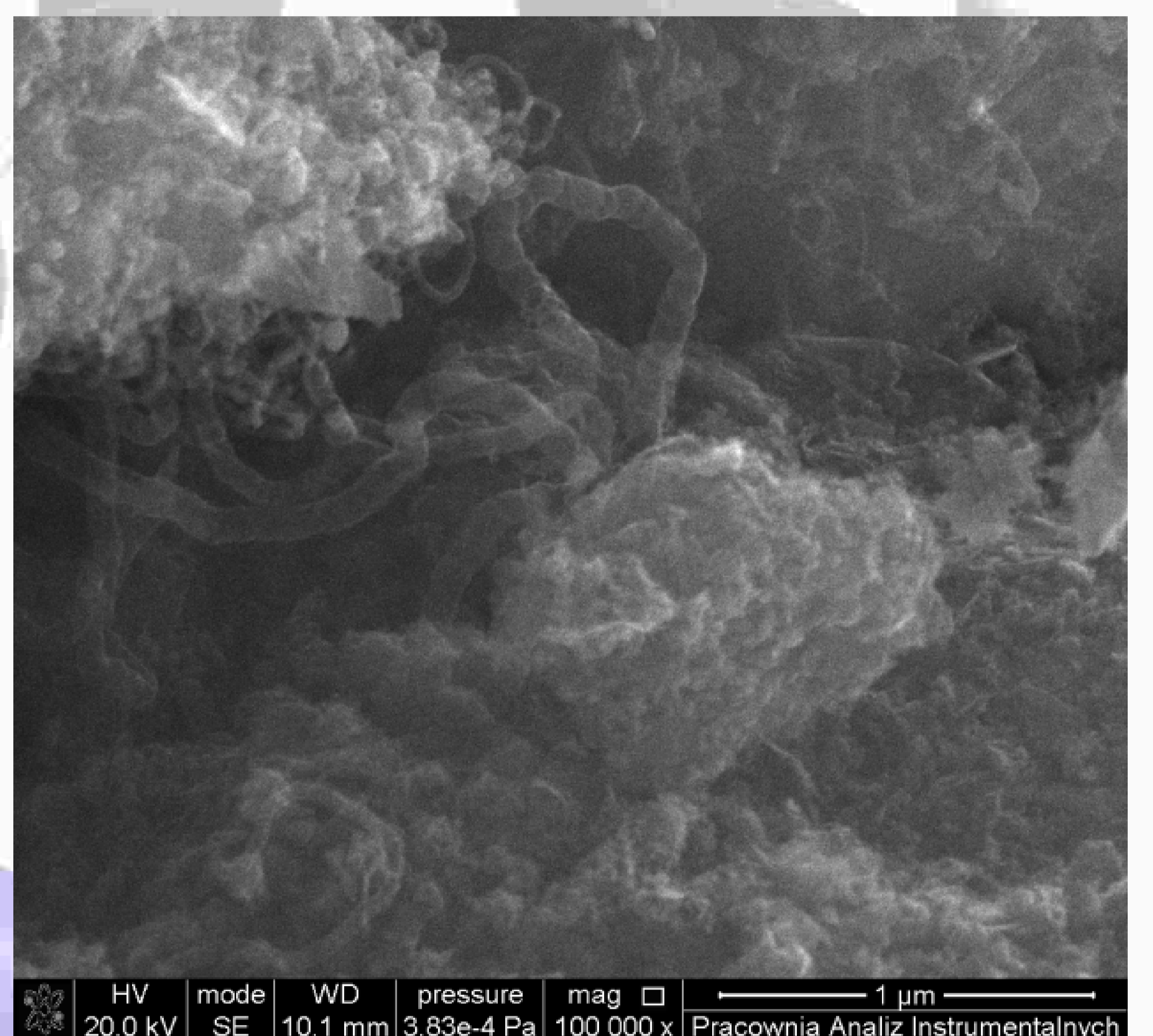
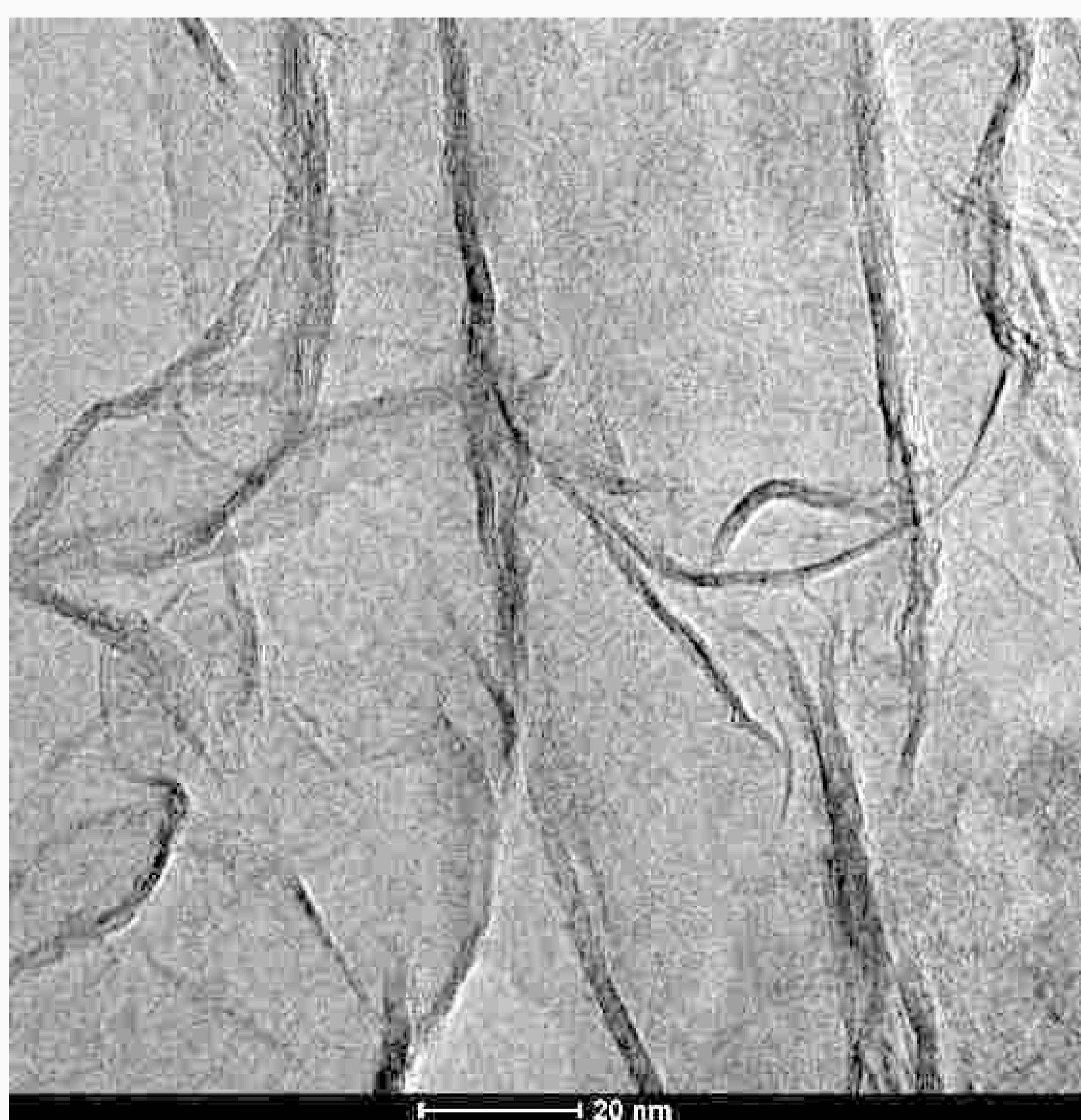
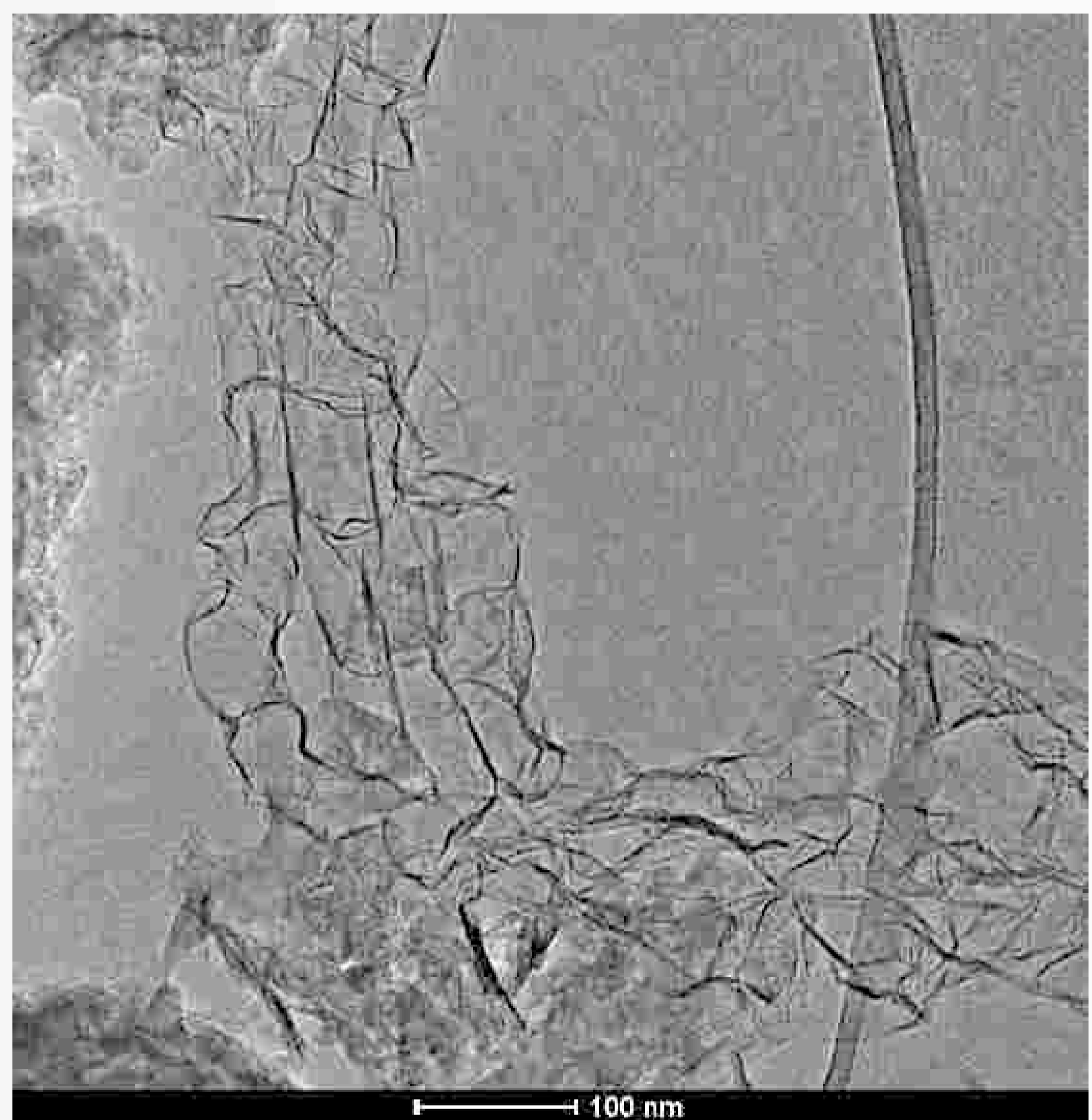
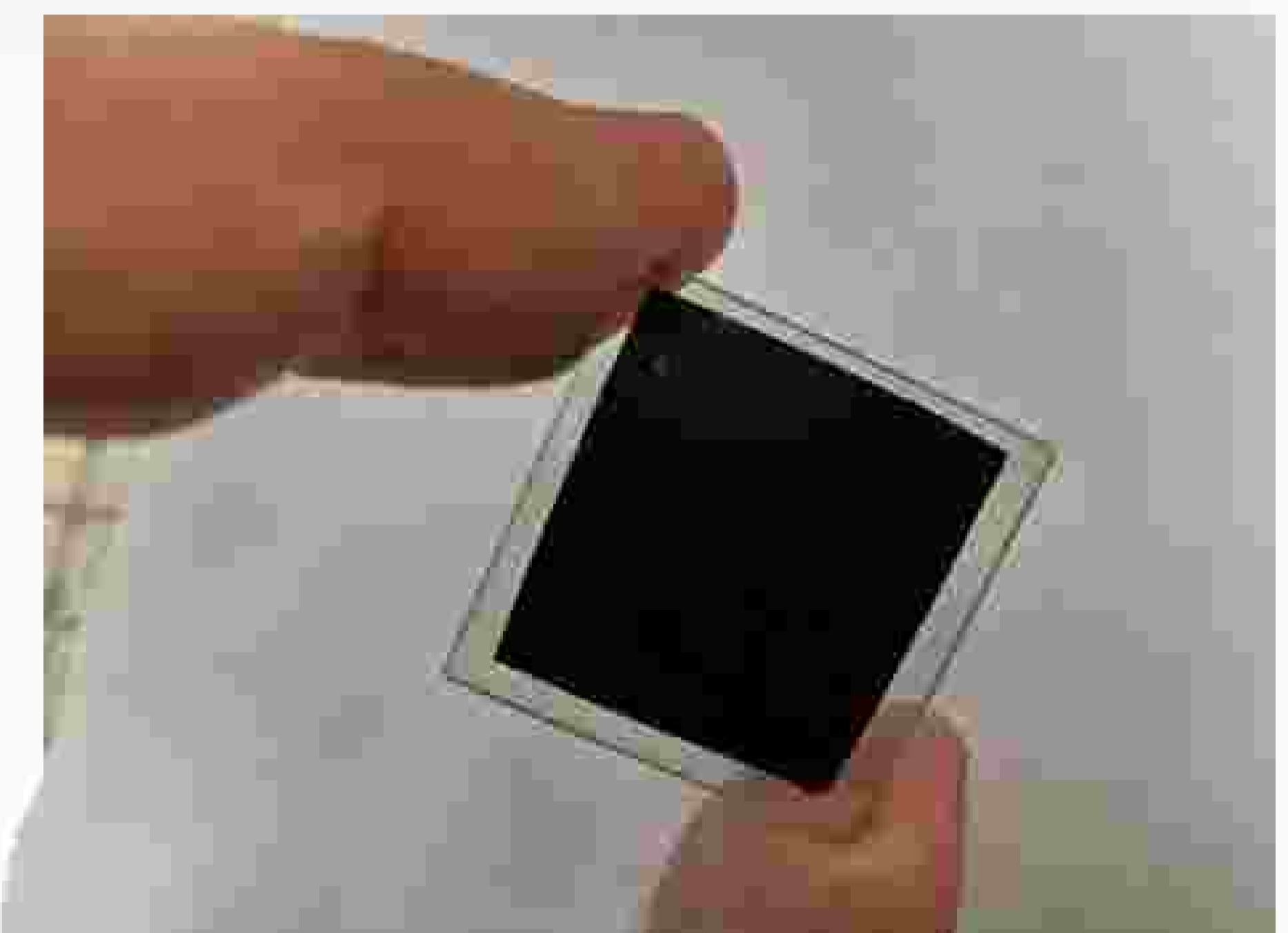
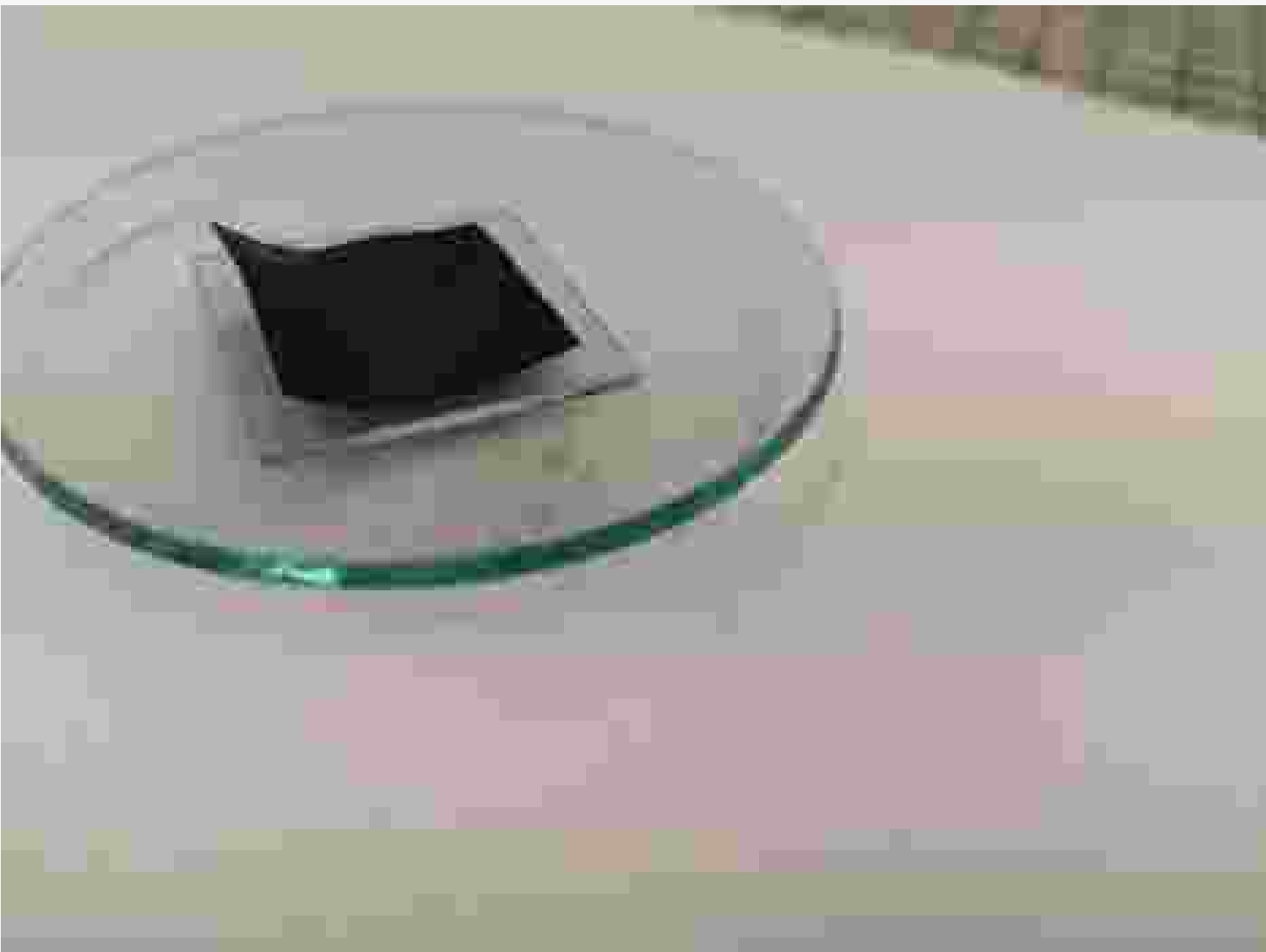


Fig. 1. HRTEM and SEM images of the obtained materials

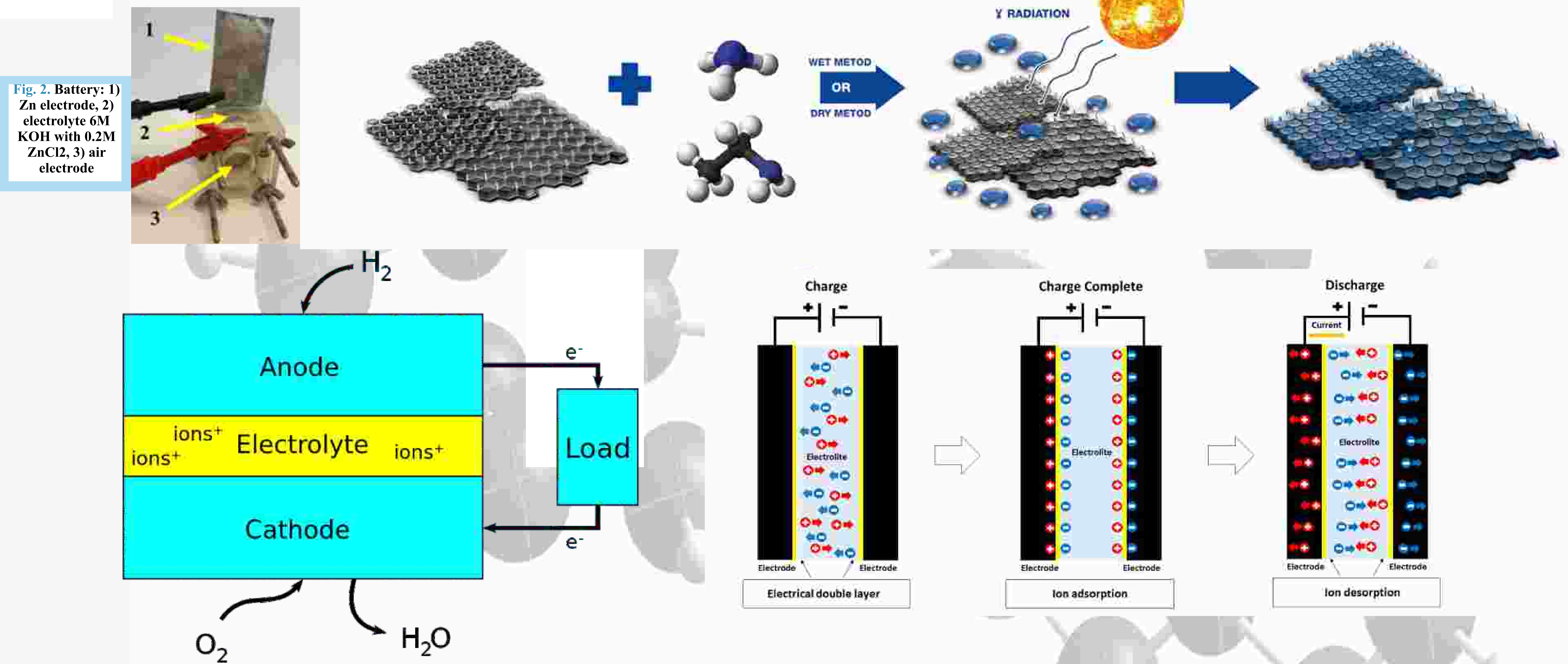


Fig. 2. Battery: 1) Zn electrode, 2) electrolyte 6M KOH with 0.2M ZnCl₂, 3) air electrode

Fig. 3. Potential applications electrode material for fuel cells, batteries, supercapacitors or photovoltaic cells

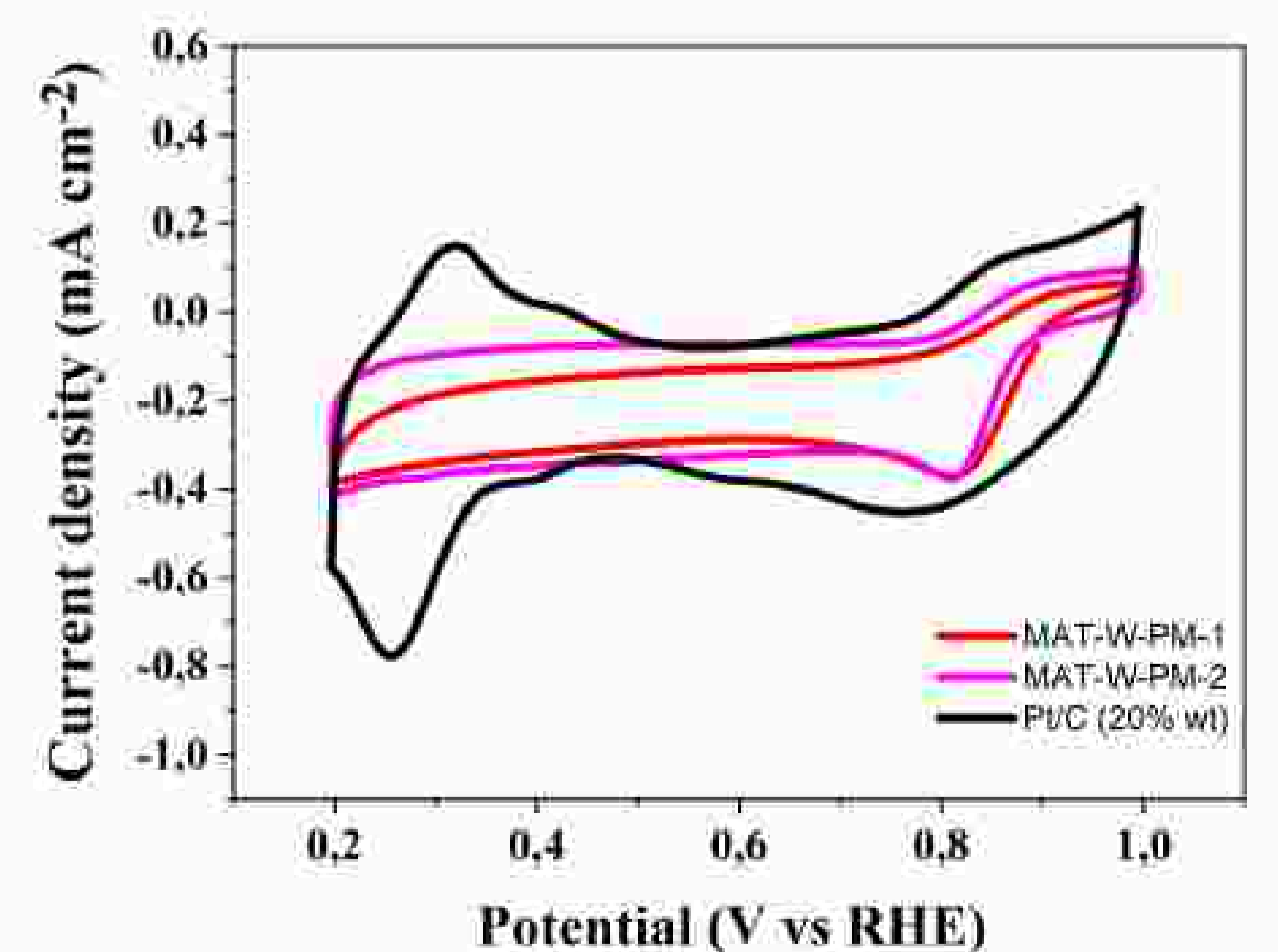
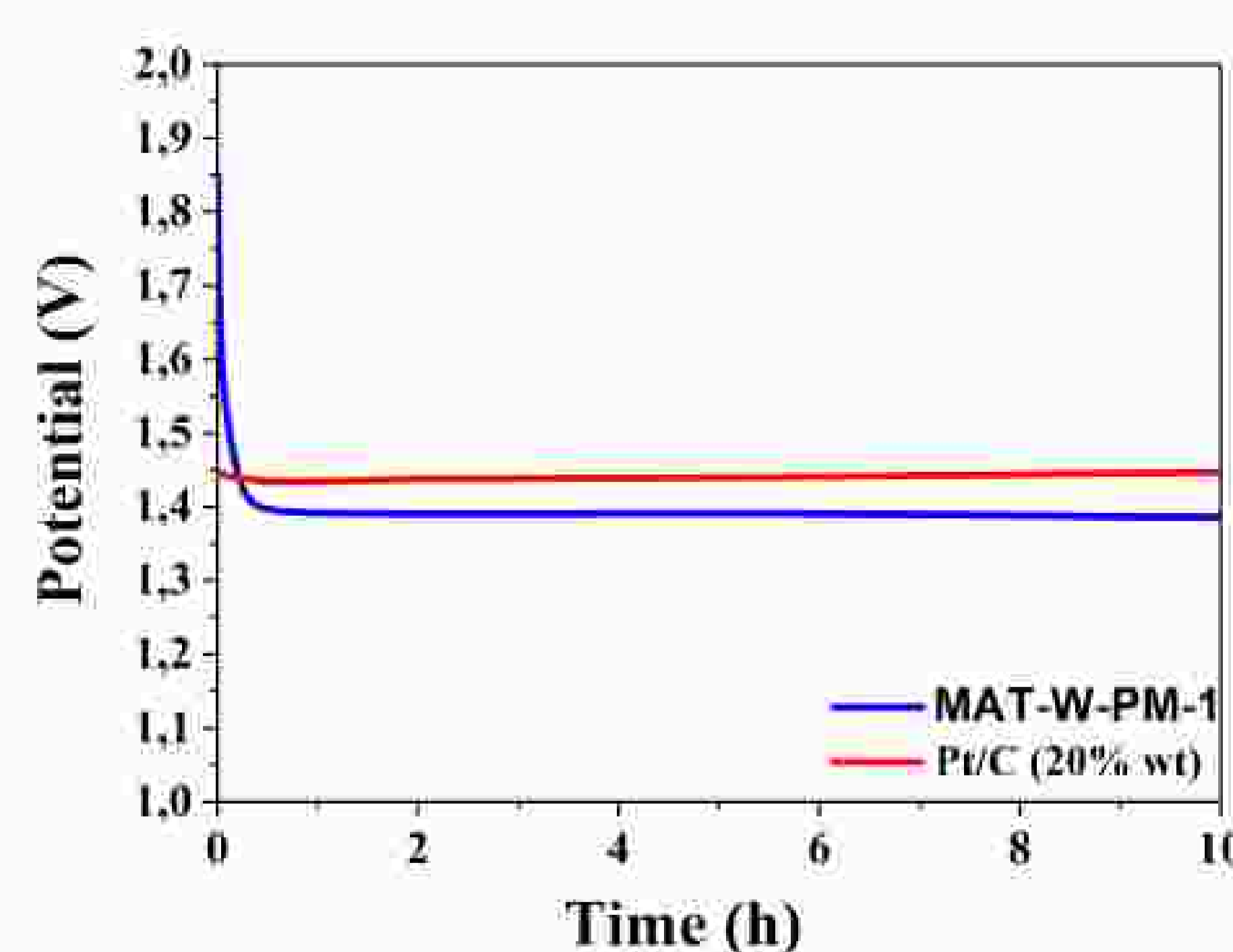


Fig. 4. CV curves and galvanostatic discharge curves for the obtained materials

MARKET ADVANTAGE

The irradiation method is very selective regarding the chemical form of inserted heteroatoms, which are exclusively bonded as quaternary groups, i.e. functional groups exceptionally useful for the improvement of such doped carbon-based electrodes in batteries and supercapacitors. The method is based on the innovative use of cheap raw materials - graphite, melamine foam.

Registration to the Polish Patent Office P.441400 and P.435136.

POTENTIAL INVESTORS

The recipients of technology for the production of the above-mentioned materials are the numerous manufacturers of supercapacitors, metal-air batteries, fuel cells or photovoltaic cells. The primary recipients for the current manufacturing technology of the new carbon materials can be found among the intermediaries that buy the technologies in the early stage of development and further develop them to the level of practical applicability.

ACKNOWLEDGEMENTS

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