











Research Activities on Graphite in BATAN

National Nuclear Energy Agency Indonesia



IAEA
Vienna, 07-08 November 2019

Technical Meeting on the Status of the IAEA Nuclear Graphite Knowledge Base

batan

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OUTLINE

- BACKGROUND
- RESEARCH ACTIVITIES
- FUTURE WORKS & PROPOSED ACTIVITIES



BACKGROUND

world nuclear news

Energy & Environment | New Nuclear | Regulation & Safety | Nuclear Policies | Corporate | Uranium & Fuel |

Progress with Indonesian SMR project

16 March 2018

Share

Indonesia's National Atomic Energy Agency (Batan) has launched a roadmap for developing a detailed engineering design for its Experimental Power Reactor (*Reaktor Daya Eksperimental*, RDE). The design of the country's indigenous small modular reactor is expected to be finalised later this year.



world nuclear news

Energy & Environment | New Nuclear | Regulation & Safety | Nuclear Policies | Corporate | Uranium & Fuel | W

Indonesia and IAEA strengthen cooperation

06 February 2018

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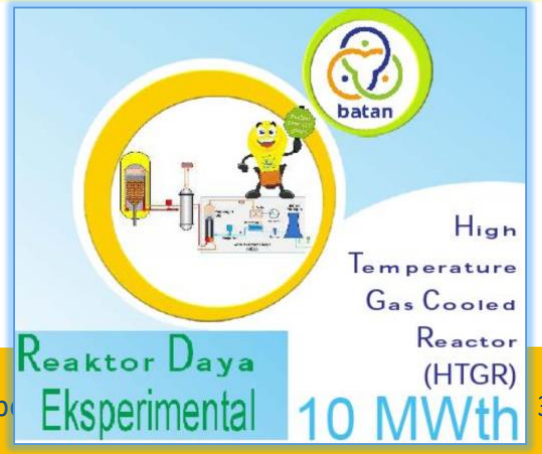
The International Atomic Energy Agency (IAEA) and Indonesia signed a practical arrangement yesterday to promote nuclear science and technology, and to strengthen technical cooperation among developing countries.



Amano and Nasir at the signing of the practical arrangement (Image: IAEA)

Puspiptek Serpong ~45 Km from Jakarta





BACKGROUND

BATAN: National Nuclear Energy Agency - INDONESIA
Established since 1958.



Radioisotopes



Materials Research



Nuclear Fuel Test



3 Research Reactors in Indonesia



TRIGA 2000 Reactor

- Location: Bandung, West Java
- Type: TRIGA reactor
- Thermal power: 2000 kW
- First critical at **1964** (250 kW)



Kartini Reactor

- Location: Yogyakarta (Central Java)
- Type: TRIGA reactor
- Thermal power: 100 kW
- First critical at **1979**



G.A. Siwabessy MPR

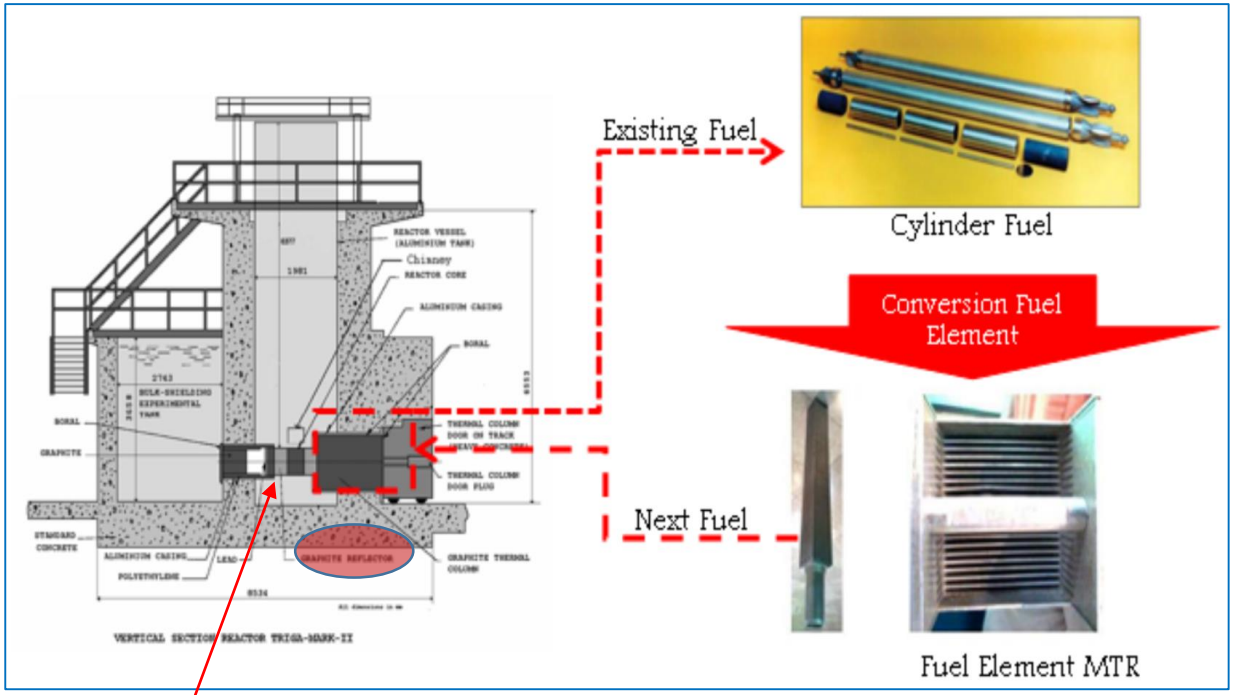
- Location: Serpong, (Banten)
- Type: Multi Purpose Reactor
- Thermal power: 30 MW
- First critical at **1987**

BACKGROUND



TRIGA 2000 Reactor

- Location: Bandung, West Java
- Type: TRIGA reactor
- Thermal power: 2000 kW
- First critical at **1964** (250 kW)



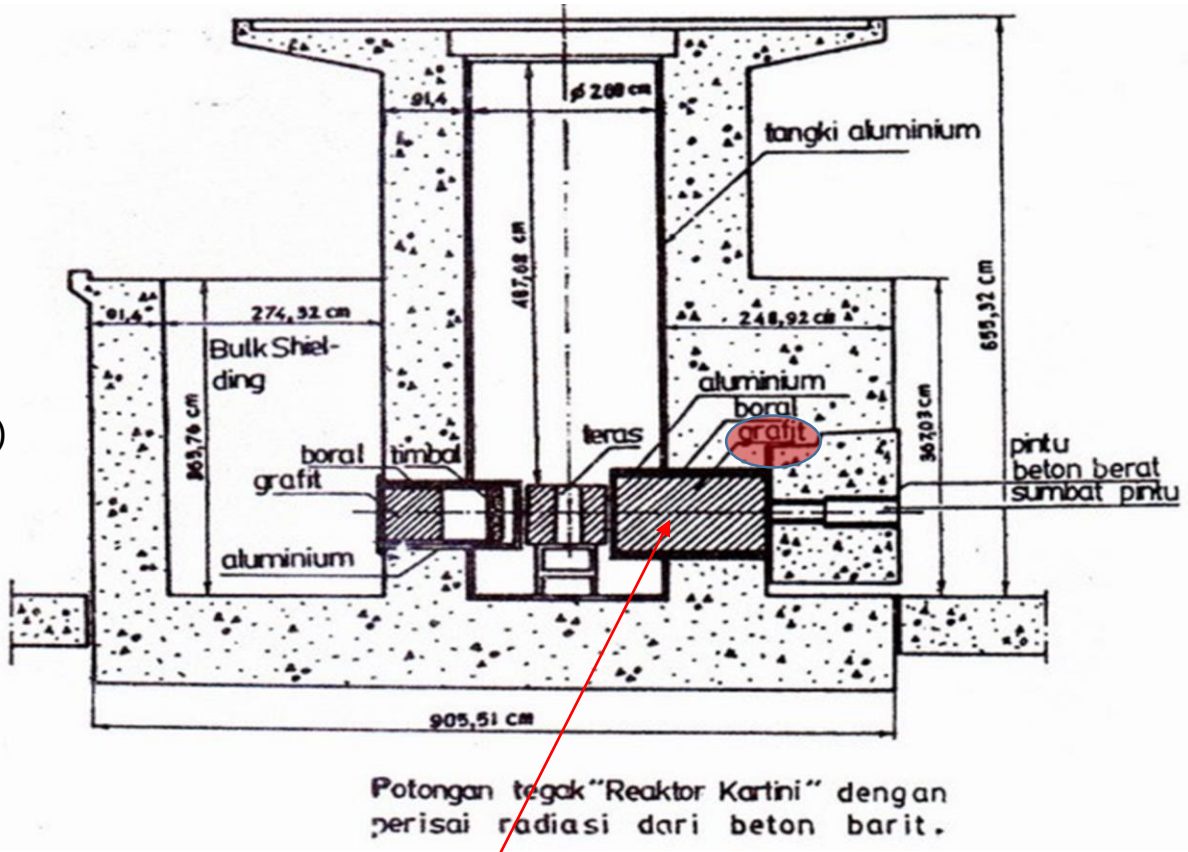
Graphite as reflector

BACKGROUND

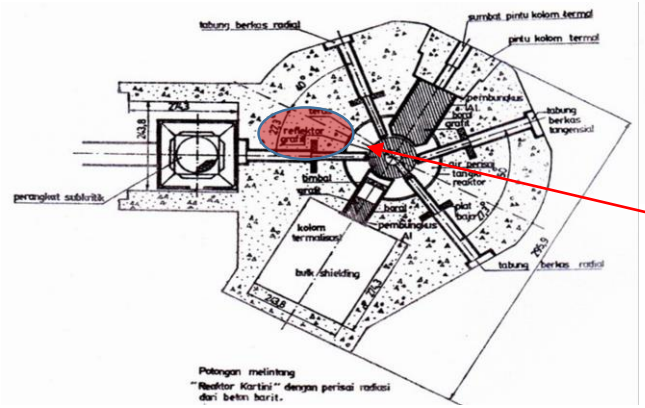


Kartini Reactor

- Location: Yogyakarta (Central Java)
- Type: TRIGA reactor
- Thermal power: 100 kW
- First critical at **1979**



Potongan tegak "Reaktor Kartini" dengan perisai radiasi dari beton barit.



Potongan melintang "Reaktor Kartini" dengan perisai radiasi dari beton barit.

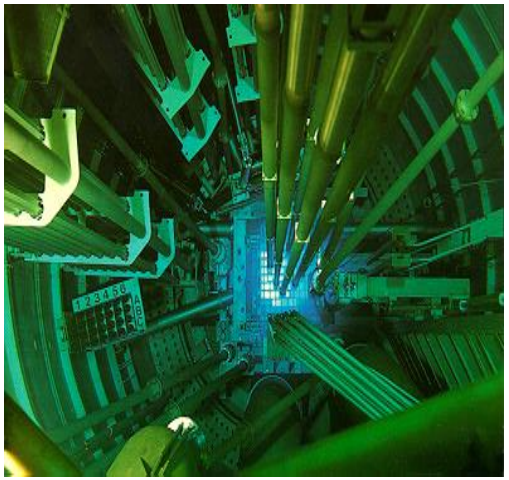
Graphite as reflector

BACKGROUND



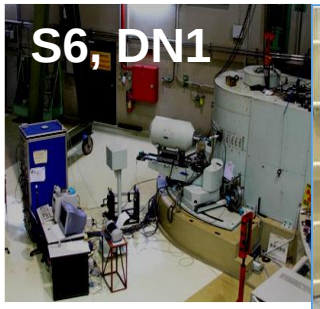
G.A. Siwabessy MPR

- Location: Serpong, (Banten)
- Type: Multi Purpose Reactor
- Thermal power: 30 MW
- First critical at **1987**



XHR - *Experimental Hall Reactor* & NGH - *Neutron Guide Hall*

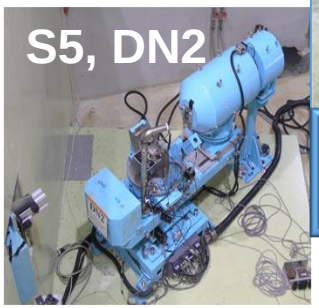
BACKGROUND





Lattice and spin dynamics (Atomic scale ~ A)

Materials characterization from atomic to macro (Angstrom to mm) scales





Structure, inhomogenity (micro scale:~ μm)



Pores, cracks (macro scale:~ mm)



Elemental analysis



Crystal structure (atomic scale: ~



Structure, Inhomogenity (nano scale:~ nm)

Neutron Radiography/ Tomography

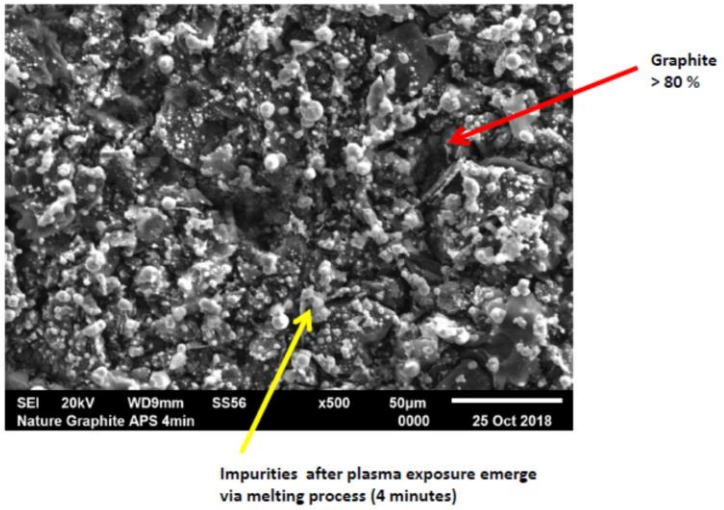
Neutron Activation Analysis

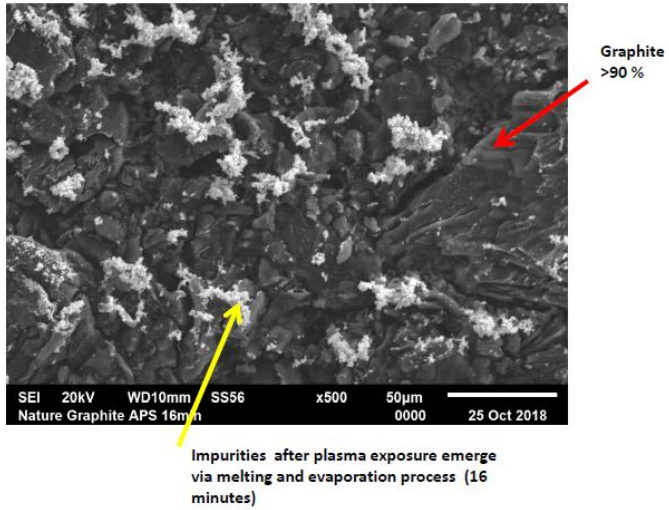
Neutron Diffractometer

Neutron Spectrometer

RECENT ACTIVITIES

- Oxidation Investigation of Graphite IG-110 and IG-11 At High Temperature
  Abu Khalid Rivai *et al*
- The Potential of Indonesian Natural Graphite as EPR / *RDE* Fuel Matrix
  Deni Mustika *et al*
- Purification of Indonesian Natural Graphite BY Arc Plasma Technique
  Arbi Dimyati *et al*



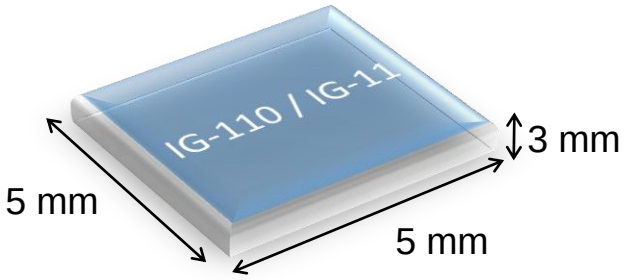


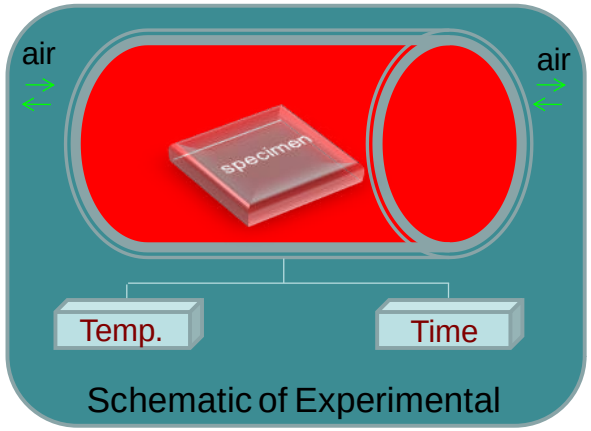


RECENT ACTIVITIES

Oxidation Investigation of IG-110 and IG-11 At High Temperature (Preliminary Study)

Parameter	Conditions
Specimen material	**Graphite IG-110 and IG-11**
Temperature of treatment (ºC)	600 (air), 800 (vacuum & air)
Type of environment	Air (100%) and Vacuum (~344 mTorr)
Time of testing	240 minutes

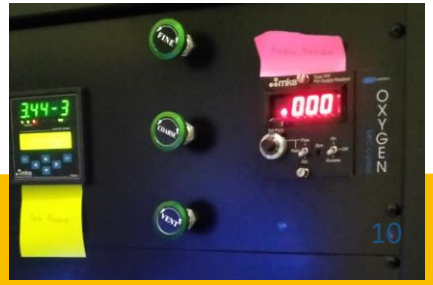




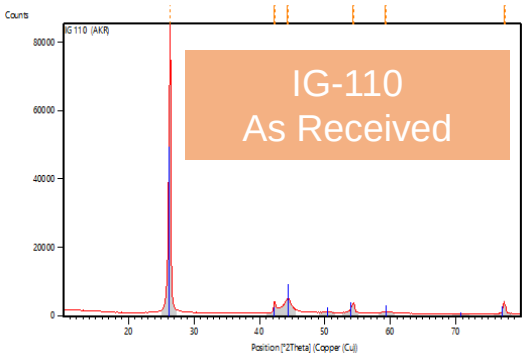
Schematic of Experimental



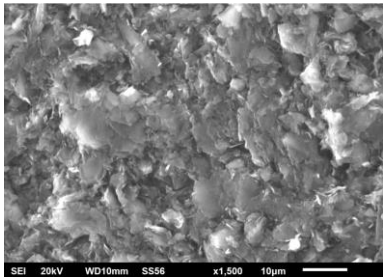
Vacuum

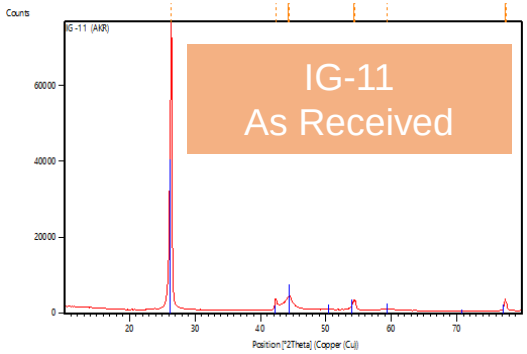


RECENT ACTIVITIES

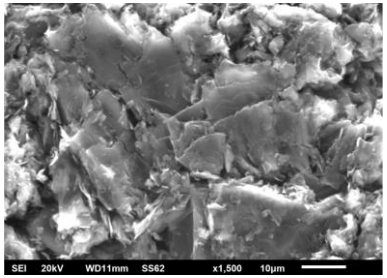


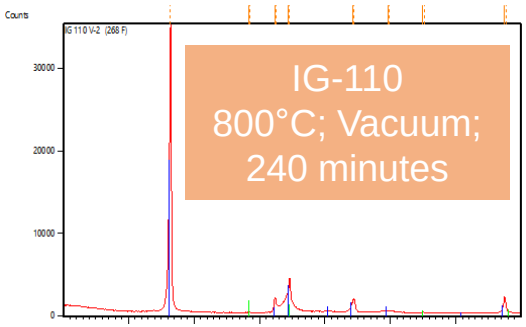
IG-110
As Received



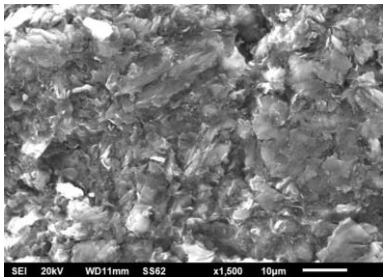


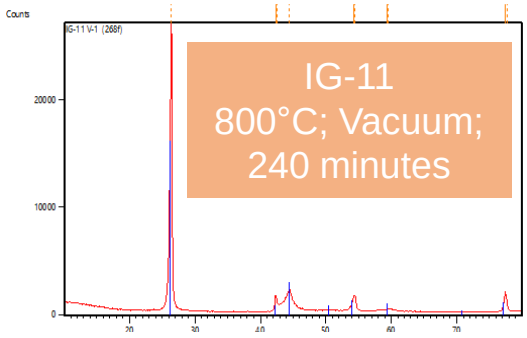
IG-11
As Received



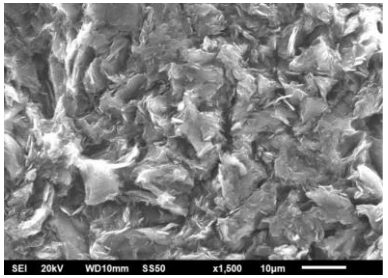


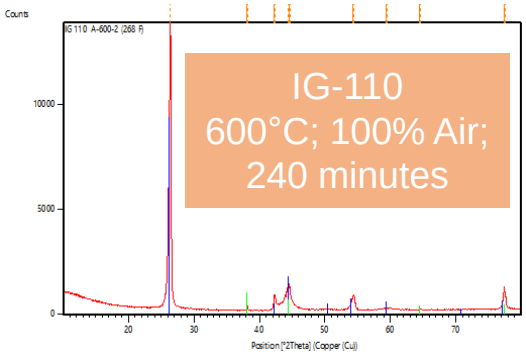
IG-110
800°C; Vacuum;
240 minutes



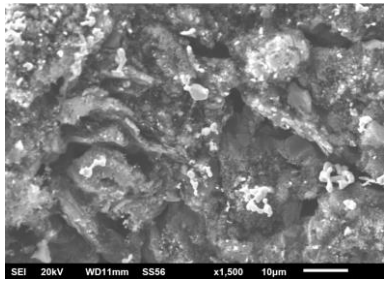


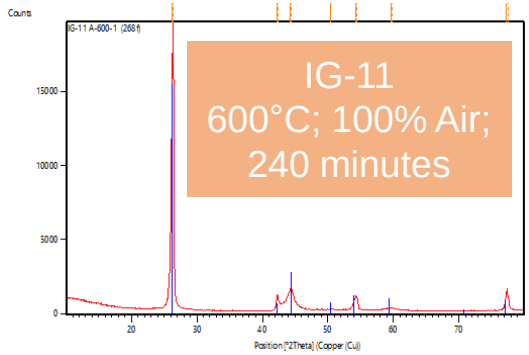
IG-11
800°C; Vacuum;
240 minutes



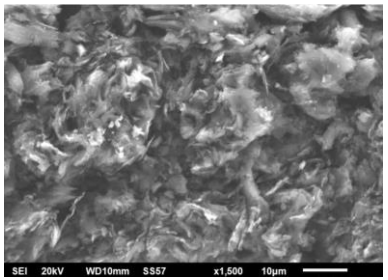


IG-110
600°C; 100% Air;
240 minutes

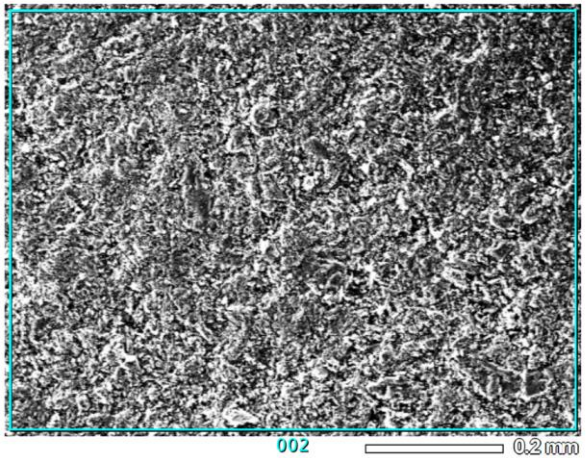


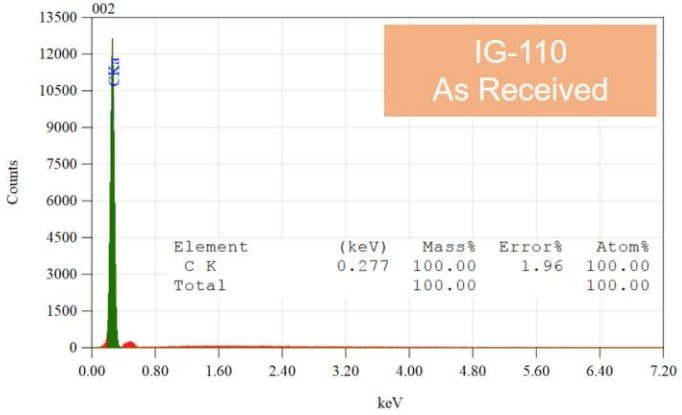


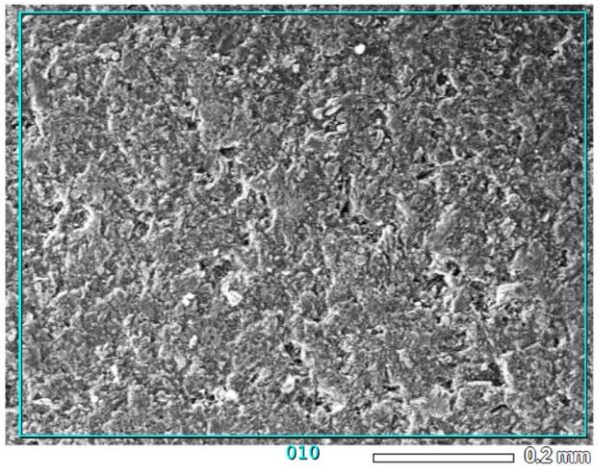
IG-11
600°C; 100% Air;
240 minutes

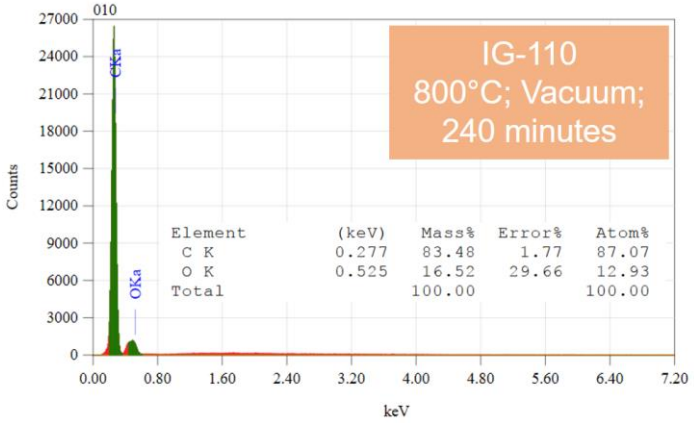


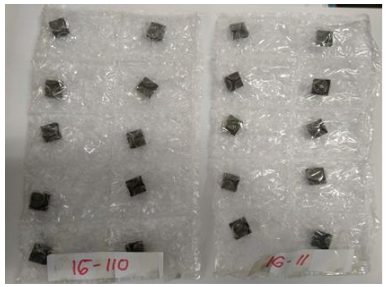
RECENT ACTIVITIES

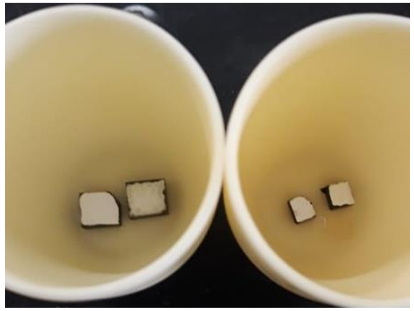












Before

After

600°C; 100% Air;
240 minutes

FUTURE WORKS & PROPOSED ACTIVITIES

- Utilization of Neutron Scattering Technique (BATAN's Facilities) For Graphite R&D.
- Further Investigation of Graphite IG-110 and IG-11.
- R&D of Graphite For Nuclear Fuel Matrix and Nuclear Reactor Structures/Reflector Materials, Including Utilization of Arc Plasma System.

THANK YOU

danke schön











