The current situation and challenges on the development of research environments for advanced research equipment in Malaysia

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OUTLINE OF PRESENTATION:

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4. Issues & challenges concerning the development of research environments for advanced research equipment In Malaysia
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Introduction on Malaysian Nuclear Agency:

Malaysian Nuclear Agency is a leading research and development (R&D) organization in the field of nuclear science and technology in Malaysia which continues to play an active role and contribute to implementation and achievement of national science and technology policies.

Organizational Function:

1. To conduct R&D&C&I in the field of nuclear science and technology;
2. To provide technical service and training in nuclear and related technology;
3. To coordinate and manage nuclear affairs at national and international level as a liaison agency for the International Atomic Energy Agency (IAEA) and the National Authority for the implementation of the Comprehensive Nuclear-Test-Ban Treaty (CTBT); and
4. To act as the National Centre for Radiation Metrology and as the National Radioactive Waste Management Center

Large Research Facilities in Malaysian Nuclear Agency (cont.)

REACTOR TRIGA PUSPATI

- Rotary Specimen Rack is used for activation analysis and isotope production (e.g. Iridium-192, Phosphorus-32, Iodine-131, Samarium-153).
- Pneumatic Transfer System for the production of very short-lived radioisotopes.
- Central Thimble in the centre of the core provides space for irradiation of samples at the point of maximum flux.
- Beam Ports provide tubular penetrations through concrete shield and the reactor tank water, making beams of neutron and gamma radiation available for a variety of purposes.
- Neutron Radiography Facility (NuR2).
- Small Angle Neutron Scattering Facility (SANS)

SINAGAMA Plant

- Sterilization of Medical Devices, Packaging Materials & Laboratory Supplies
- Sterilization of Pharmaceutical Products
- Foods, Herbs & Spices
- Veterinary Product
- Fruits

ELECTRON BEAM IRRADIATION FACILITIES (3.0 MeV & 200 keV)

- Cross link of wire and cable insulation, heat-shrink tubes & polymer materials,
- Electron irradiation (EI) process of wafer semiconductor.
- Cross-linking and sterilizing of pharmaceutical products such as gloves, syringes and non-set dressing,
- Sterilization of medical products,
- Flue gas treatment,
- Waste water and sewage of industrial treatment.
- Surface treatment of various applications in wood, plastic and steel, including particle boards, fiber boards, aluminum foil and ink.

https://www.nuclearmalaysia.gov.my/eng/kemudahan-rnd.php

Large Research Facilities in Malaysian Nuclear Agency (cont.)

NATURAL RUBBER LATEX IRRADIATION FACILITY (RAYMINTEX PLANT)

- RAYMINTEX plant is a pilot plant for irradiation and vulcanization of natural rubber latex by using gamma radiation.
- Natural rubber latex needs to be vulcanized prior to use by latex dipped product manufacturers such as glove, balloon, finger cot, baby pacifier and dental dam manufacturers.

GAMMA GREENHOUSE (GGH)

- GGH is the only chronic irradiation facility in the region for mutation induction in plants and biological samples at low dose radiation over a long period of time depending on the type and sensitivity of the sample.
- It consists of a circular greenhouse with 15 meter radius, a control room and an irradiator. The irradiator contain Ceasium-137 source that produces low dose gamma radiation.
- GGH has been appointed by the IAEA as IAEA Collaborating Center (ICC) for 2019-2023.

GAMMA CELL

- Gamma cell Biobeam GM 8000 (GmbH, Germany) suitable for acute radiation on agricultural samples; seeds, cuttings, bulbs, corms, suckers and plant tissue culture samples; callus and somatic embryo to induce mutagenesis.
- Other applications include biological effects of gamma-radiation on microbes, insects, animal and human cells, calibration of low dose range dosimeter and basic insect disinfestations study.

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Large Research Facilities in Malaysian Nuclear Agency (cont.)

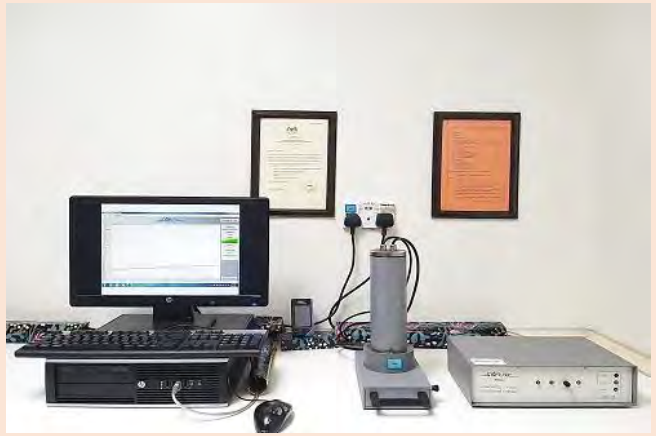
STABLE ISOTOPE ANALYSIS LABORATORY

- The Stable Isotope Analysis Laboratory is equipped with the latest equipment for processing, weighing and analysis of samples of food and agricultural products.
- Main analyzer:
  - Gas Chromatography Elemental Analyzer Isotope Ratio Mass Spectrometer" (GC-EA-IRMS)
  - Laser spectroscopy

FLORA VITRO LABORATORY

- Flora Vitro Laboratory is a commercial tissue culture laboratory for production of plant seedlings through in vitro techniques.
- It is equipped with offices, a meeting room, medium preparation and washing areas as well as an aseptic/clean area, which consists of a large transfer room and three incubation rooms.
- The incubation rooms can hold up to 300,000 tissue culture plants at one time with a production capacity of approximately 1.8 million plants a year.

PHOTOSTIMULATED LUMINESCENCE LABORATORY (PSL)



- PSL provides research and services for screening of irradiated food is used to detect irradiated of any food items that contain mineral debris, especially silicates mineral and bioinorganic.
- The PSL technique is particularly suited to the investigation of wide range of food items containing mineral deposits, for instance herbs, spices, seasonings, fruits and vegetables, shellfish, meat products, cereals, bulbs and tubers.

https://www.nuclearmalaysia.gov.my/eng/kemudahan-rnd.php

Advanced research equipment in Malaysian Nuclear Agency (cont.)

1. AB SCIEX TRIPLE TOF 5600 + SYSTEM
2. BALL MILLING SYSTEM
3. WAVE BIOREACTOR
4. IMAGEXPRESS MICRO XL AND METAPRESS 5.1 HIGH CONTENT SCREENING SYSTEM
5. HIGH PERFORMANCE COMPUTER (HPC) SERVER
6. ULTRA HIGH PERFORMACE LIQUID CHROMATOGRAPHY (UHPLC)
7. LOJI FITOFARMASEUTIKAL
8. PILOT PLANT FOR HERBAL PRODUCT FORMULATION AND PRODUCTION
9. VIBRATING SAMPLE MAGNETOMETER (VSM)
10. MAKMAL ANALISIS KIMIA
11. MAKMAL BIOMOLEKUL
12. MAKMAL FITOKIMIA
13. MAKMAL KULTUR SEL
14. MAKMAL HISTOLOGI
15. MAKMAL TOKSIKOLOGI
16. SURVEY METERS
17. ATOMIC FORCE MICROSCOPE (AFM) XE-70
18. DEKSTOP SCANNING ELECTRON MICROCOPY (SEM)
19. MICROSTEREOLITHOGRAPHY
20. ASYMMETRICAL FLOW FIELD-FLOW FRACTIONATION-MULTI ANGLE LASER LIGHT SCATTERING (AFFFF-MALLS)
21. LIQUID SCINTILLATION COUNTER, QUANTULUS 1220 (ULTRA LOW)
22. THYROID COUNTER
23. WHOLE BODY COUNTER
24. MULTIMODE PLATE READER
25. OPTICAL STIMULATED LUMINISCENE (OSL) READER
26. DOSE CALIBRATOR
27. PORTABLE GAMMA NUCLIDE IDENTIFIER
28. SIMULTANEOUS THERMAL ANALYZER (STA)
29. PETELELIHAT AKUSTIK
30. IRRADIATING APPARATUS AND EQUIPMENT RELATED TO DIAGNOSTIC RADIOLOGY
31. JACKETED REACTOR
32. RUMAH HAIWAN UJIKAJI
33. SMART ALERT RADIATION DETECTION (SARD)
34. AUTOMATED METAPHASE FINDER SYSTEM
34. AUTOMATED METAPHASE FINDER SYSTEM
35. SISTEM FLUORESCENE MOLECULAR TOMOGRAPHY (FMT)
36. HISTOLOGY SYSTEM
37. LOW BACKGROUND ALPHA/BETA COUNTING MULTI-DETECTOR SYSTEM
38. CHEMICAL VAPOUR DEPOSITION (CVD) SYSTEM
39. CONSTANT POTENTIAL PHILIPS INDUSTRIAL X-RAY MODEL MG165
40. SUPER ARGUS BIO PET/CT SYSTEM
41. ZEBRAFISH SYSTEM
42. SOLVENT EXTRACTE
43. THERMOLUMINESCENT DOSIMETER
44. LEAD EQUIVALENT THICKNESS GAUGE
45. ZETASIZER

https://www.nuclearmalaysia.gov.my/eng/peralatanSaintifik.php

Issues & challenges concerning the development of research environments for advanced research equipment In Malaysia:

- Aging facilities require high maintenance cost. Research laboratories lack not only modern equipment but may even lack functional equipment.
- Lack of funding & low investment in advanced scientific research. Obstacle to acquire high cost of modern equipment.
- The rapid pace of technological change, new technologies and sociological issues. Lack of availability of high-speed internet and modern computers/ advances in computer technology in laboratories assuming.
- Costly supplies & lengthy purchasing and shipping procedures for research material (kits, isotopes and/or fine chemicals) that may not always be available locally (custom delays, short half-lives of some isotopes and instability of other products at ambient temperature make them out of reach of researchers)

Summary:

- Japan and Malaysia have already cultivated positive and amicable partnership as well as strong bilateral cooperation in nuclear science and technology for a long time. The accumulated transfer of technology by the Japanese counterparts is an encouraging basis for further development of both countries in the future.

- Malaysia appreciates for the close cooperation between Japan in the fields of nuclear science, technology and innovation.

- Japan's expertise in new and emerging technologies, artificial intelligence (AI), robotic, autonomous system and Internet of Things (IoT) could benefits Malaysia and other ASEAN Member States in advancing research environment, particularly in nuclear science and technology in the future.

- Malaysian looks forward Japanese counterparts to continuously provide its strong back towards efforts and encouragement in these sectors and to invite more researchers and scientist to jointly carry out R&D activities in Japan advanced research facilities to enhance science and technology development in Malaysia and ASEAN Member States.

Thank you.

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