5.18. Ms Sasiphan Khaweerat (Thailand)

Introduction

Undoubtedly, neutron imaging is one of the best investigation techniques for cultural heritage researches. Cultural heritage is what we obtain from the past and pass on to future generation. It contains unique and irreplaceable record that is important to fulfill our understanding about the past. Recently, many cultural heritages remain untouched and historical records are ambiguous because scientific method of proof is difficult to make without destruction. Fortunately, the neutron imaging technique allows property of neutron that can penetrate through object providing non-invasive characterization. The intensity of transmitting neutron varies upon neutron flux at exposing position and elemental composition in particular objects. Consequently, the object's provenance, manufacturing technology, authentication, and hidden structure can be determined. To achieve a high quality image and further service for cultural heritage research, good facility and practice are of significant concerns.This CRP provides great opportunity to develop neutron facility and to standardize methodology in Thailand. After official meeting between Thailand Institute of Nuclear Technology (TINT) and Office of National Museum (ONM), Fine Arts Department on 24th January 2011, we are agreed to collaborate in CRP- F11018. With supporting from IAEA, the neutron imaging technology will be sustainable developed and the strengthen collaboration between TINT and ONM will be established. TINT scientists will work in an appropriate channel to meet the state-of-the-art end user's requirements. Since the hidden historical records will be revealed, we strongly believe that the adapted neutron imaging technique will help answer questions regarding ancient Thais.

The utilization of neutron imaging technology in Thailand is limit as a result of a few numbers of neutron facilities; a research reactor and a neutron spallation sources. Neutron radiography has been developed since 1991 when a radiography facility was constructed at 8"x8" south beam tube of Thai research reactor (TRR-1/M1). Collaboration between Office of Atoms for Peace and Chulalongkorn University has been performed continuously. In 1995, ZnS(Ag) plate was invented and tested for in-house using. During 2005-2007, a Fuji BAS-ND 2040 neutron imaging plate and a Kodak MX125 X-ray film/Gd neutron converter screen combination were tested for comparison. The optimum conditions for neutron imaging plate applied for diversity of samples have been studied. More recently, we use neutron imaging technology to look inside plants, to evaluate pearl structure, to search hidden parts in some electronic devices and to investigate sculpture manufacturing technology. The current neutron imaging utilization in Thailand, however, provides unsatisfied image quality with less resolution because of uncertain and low neutron flux at exposing position and relatively high background radiation. Therefore, we have an energetic attempt to develop and enhance our neutron imaging facility for cultural heritage analysis and can be extent further for servicing diversity of samples.

Experimental facilities

- Neutron radiography beam tube at (TRR-1/M1)
- Dark room
- Radiographic film and film processing facility
- Neutron imaging plate ND 2040
- Image reader BAS 2500

Workplan year 1:

- Official cooperation between Thailand Institute of Nuclear Technology and Thai National Museum has been initiated and MOU will be signed by the end of 2012
- Collect information of proper cultural objects for neutron imaging
- Significant Thai cultural objects are exhibited at Thai National Museum, however, most pieces are well stored and undetermined. For the first phase, we aim to take image of movable objects that can fit well with our neutron beam. The focused objects should be less than 20x20 sq cm in size. The objects may be made of wide ranges of materials, for example, bronze, alloy, wood and clay.
- Develop neutron imaging facility at 8"x8" south beam tube of Thai research reactor (TRR-1/M1)
- The exposing position should be modified for easy accessing. The slot for placing imaging plate should be well designed and can be adjustable for different size of objects.
- Attend the first RCM

Main objective	**Sub objectives**	**Year 1**				**Year 2**				**Year 3**			
		Q1	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Data collection	Get information	X	X										
	Compile info		X										
	Develop neutron radiography facility including sample exposure station			X	X	X							
Experiment	Planning					X	X						
	Neutron radiography							X	X	X	X		
	Results											X	
	Documentation											X	X