5.12. Mr Jacek J. Milczarek (Poland)

Introduction

Due to heavy losses during last war austerities the public opinion in Poland is very conscious on the preservation of the national cultural heritage objects. The preservation of cultural heritage in Poland is supervised and financed by the Ministry of Ministry of Culture and National Heritage with the Department of Cultural Heritage and the National Heritage Board established in Warsaw. There are over 400 museums in the country, from which 110 museums are the registered ones. The 12 national museums and 12 archaeological ones exist in major Polish cities. There are approximately 1000 excavation sites in Poland explored for 6 months in year. The archaeological research currently well developed and the X-ray radiography is widely used for investigation of excavation findings.

Experimental facilities

Since 2001 the neutron and gamma radiography facility (NGRS) has been working at the nuclear research reactor MARIA at Świerk, 25 km form the Warsaw centre. The MARIA is a water pool reactor of nominal 30 MWth power. Besides water pool each fuel element has its own separate cooling system.

The NGRS facility is a standard white beam neutron radiography station located at the reactor experimental hall at one of the neutron horizontal beams. The system consists of two neutron beam collimators, scintillation screens (250×250 mm), mirror, optical zoom lenses and high sensitive CCD camera. The linear resolution of the registered neutron radiograms was approximately 0.1 mm, The main parameters of the station: $100 < L/D < 200$, Cd ratio = 20, and the neutron flux $1.1 \cdot 10^{7}$ cm $^{-2}s^{-1}$ at the sample position for L/D=150. The commercially available components: AST NDg 6Li:ZnS:Cu,Al,Au screens, Hamamatsu ORCA-ER camera (1280×1024 pixels, 12 bit) and LUCIA software were used.. The exposure times of 0.6–2.5 s are applied. The station is equipped with the mobile sample support/carrier, enabling the remote control tuning of the position of the investigated object with respect to the radiation beam and converter screen. The sample support can hold objects with mass to 100 kg.

Most of the activities carried out with the NGRS facility have been basically of scientific character. In particular the processes of water migration in various porous media have been studied for imbibition and drying.

Our invitations directed to some of the archaeological institutes and museums were met with positive responses mainly from researchers active in the investigations of the objects found currently at the excavation sites. Some parts of early mediaeval shield and swords were offered as first objects for neutron radiography analysis.

There are four main objectives of the Polish participation in the CRP:

1. Development of NR facility for efficient investigations of archaeological artefacts with thermal neutron tomography.
2. Examination of archaeological artefacts delivered by Polish museums and institutes.
3. Examination of excavated objects before cleaning.
4. Development of Web accessible database for the NI investigated artefacts.

Workplan year 1:

1. Design and construction of computer controlled rotation table for performing the tomographic projections.
2. Choice and purchase of software for computer tomography
3. Neutron projections for components of mediaeval shields and sword hilts.

4. Dissemination of information on availability of the NI technique for Polish museum and archaeological institutions.

Main objective	Sub objectives	Year 1				Year 2				Year 3			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Facility development at MARIA reactor	Rotation computer controlled table		X	X	X								
	Software for CT			X	X	X							
	Projections for shields and swords		X	X	X								
	Information on NI availability for Polish CH institutions		X	X	X								
Neutron radiography examination of artifacts from Polish institutions	Development of protocols and forms					X	X						
	Collection of artefacts					X	X	X	X	X			
	Examination of chosen items					X	X	X	X	X	X		
	SANS investigation of bronze elements							X	X	X	X		
Development of web accessible database of the NI results for Polish artifacts	Information on Czersk excavation findings									X	X	X	
	Database implementation									X	X	X	
	Final reports and publications									X	X	X	X