TeaM CABLES

European Tools and Methodologies for an efficient ageing management of nuclear power plant Cables

Deliverable D3.1: Database available for upload

WP3: Cable and material characterisations

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Description: Set-up of database, enabling the upload of characterisations.

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1 Executive Summary

This document is the deliverable 3.1 of the TeaM Cables project.

The purpose of this deliverable is the definition of the database that will aggregate the results of the TeaM Cables project. Thus, this deliverable defines:

- the rules of data identification
- the role of the consortium members in the completion and maintenance of this database,
- the data formats used in relation to the different characterisations,
- the format of the database,
- the accessibility to the database.

2 Introduction

All results of the measurements (chemical, spectral, physical, mechanical…) made on all the samples of interest in the TeaM Cables framework will be gathered to build a global database consisting of several databases corresponding to each analysis technique used.

The interpretation of those results, thanks to chemometric methods, will lead to a better understanding of the impact of the thermal ageing and of the γ-irradiation on the materials in cables of nuclear plants.

3 Data identification

The following sample identification system will be applied for sample marking before analyses and measurements. Identification codes will be written in the following order:

Material – Form of sample – Ageing – Duration or Dose – Accidental simulation – Measurement – Contributor – Measurement repetition.

Codes are indicated below in Table 1 to Table 8.

Nota bene: If additional information is required for identification, it may be indicated in square brackets.

Material	Code
Silane crosslinked PE	**Mod1**
Silane crosslinked PE + 1phr of a phenolic antioxidant	**Mod2**
Silane crosslinked PE + 1phr of a thioether antioxidant	**Mod3**
Silane crosslinked PE + 1phr of a phenolic AO + 1phr of a thioether antioxidant	**Mod4**
Silane crosslinked PE + 25phr of ATH	**Mod5**
Silane crosslinked PE + 50phr of ATH	**Mod6**
Silane crosslinked PE + 50phr of ATH + 1phr of a phenolic antioxidant + 1phr of a thioether antioxidant	**Mod7**
Coaxial cable : **XL**PE insulation, not filled	**CoXL**
Twisted pairs cable **: XL**PE insulation**, N**ot filled	**TXLN**
Twisted pairs cable**: XL**PE insulation, **F**illed (antioxidant + ATH)	**TXLF**
Twisted pairs cable: **EV**A/**EP**DM insulation	**EVEP**

Table 1: Data identification - Material codes

Form	Code
Ta**pe**	**Tpe**
Shee**t**	**Sht**
Dumb**b**ell	**DuB**
Short **Ca**ble	**SCa**
Long **Ca**ble	**LCa**
Insulation alone	**Ins**

Table 2: Data identification - Form codes

Ageing	Code
Unaged	**UnA**
Thermal **a**geing at **87**°C	**TA87**
Thermal **a**geing at **110**°C	**TA110**
Thermal **a**geing at **130**°C	**TA130**
Radiolytic **a**geing at **87**°C **5**Gy/h	**RA(87)5**
Radiolytic **a**geing at **R**oom **T**° **5**Gy/h	**RA(RT)5**
Radiolytic **a**geing at **R**oom **T**° **40**Gy/h	**RA(RT)40**
Radiolytic **a**geing at **R**oom **T**° **300**Gy/h	**RA(RT)300**

Table 3: Data identification - Ageing codes

Duration of Ageing/sampling intervals	Code
1st sample after t months of TA=Dur1	**Dur1**(to be specified in months)
2nd sample after u months of TA=Dur2	**Dur2**(to be specified in months)
3rd sample after v months of TA=Dur3	**Dur3**(to be specified in months)
4th sample after w months of TA=Dur4	**Dur4**(to be specified in months)
5th sample after x months of TA=Dur5	**Dur5**(to be specified in months)
1st sample after t month of RA=Dose1	**Dose1**(to be specified in kGy)
2nd sample after u months of RA=Dose2	**Dose2**(to be specified in kGy)
3rd sample after v months of RA=Dose3	**Dose3**(to be specified in kGy)
4th sample after w months of RA=Dose4	**Dose4**(to be specified in kGy)
5th sample after x months of RA=Dose5	**Dose5**(to be specified in kGy)

Table 4: Data identification - Sampling intervals codes

Accidental simulation	Code
No accidental **s**imulation	**NoAS**
AD* + **DB**E + post-DBE **A**ccelerated (15 - 30 days)	**DBAc**
AD + **DB**E + post-DBE **N**ot-**A**ccelerated (350 days)	**DBNA**
AD + **SA** simultaneously performed at UJV	**SA[UJV]**
AD + SA simultaneously performed at IRSN	**SA[IRS]**

Table 5: Data identification - Accidental simulation codes
**AD:Accidental dose*
***DBE: Design Basis Event*
****SA: Severe Accident*

Characterization	Code
FTIR	**FTIR**
OIT	**OIT**
UV spectroscopy	**UV**
High Resolution Gas Mass Spectrometry	**MSgas**
Swelling	**Swel**
DMTA	**DMTA**
EPR	**EPR**
EaB	**EaB**
Electrical **Per**mittivity	**ElPer**
Reflectometry	**Refl**
THz technic	**THz**
Hardness	**Hard**
Micro **ind**entation	**Ind**
isothermal **TGA**	**isoTGA**
S-Matrix	**SMat**
Capacitance	**Cap**
Tan δ	**Tan**
SEM	**SEM**
Resistivity	**Res**
Permeability	**Perm**
Insulation **R**esistance	**InR**
X-ray **t**omographic **s**canning	**XrTS**
Young **mod**ulus	**YMod**

Table 6: Data identification - Characterization codes

Contributor	Code
CEA	**CEA**
UJV	**UJV**
NEXANS	**NEX**
INCT	**INC**
IZFP	**IZF**
IRSN	**IRS**
VTT	**VTT**
ENSAM	**ENS**
UNIBO	**UNI**

Table 7: Data identification - Contributor codes

Measurement repetion	Code
Measure 1	**a**
Measure2	**b**
Measure3	**c**
Measure4	**d**
Measure5	**e**

Table 8: Data identification - Measurement repetition codes

Examples:

The 3rd measurement carried out by ENSAM by swelling measurement of a Dumbbell of Silane crosslinked PE + 1phr of a phenolic AO + 1phr of a thioether antioxidant having been aged by thermal treatment at 110°C during 15 months then having undergone accidental conditions AD + DBE + post-DBE Not-Accelerated (see grey box of previous tables) will be called:

Mod4-DuB-TA110-15-DBNA-Swel-ENS-c

If this characterisation is carried out under particular conditions, different from the initially proposed protocol (160° C instead of 140° C for example), the identification could be the following one:

Mod4-DuB-TA110-15-DBNA–Swel[160]-ENS-c.

4 Data transfer

All types of data will have to be sent to AMU once all measurements are done with the same technique, i.e. no need to send data continuously, since treatment of data can only be done with the whole information.

One database will be built for each analysis technique, with all values measured, and without calculating the mean of values obtained in case of duplicates, triplicates or else.

Infrared spectra must be sent in .spa format, while other values have to be transferred in an Excel format, or in .csv if necessary, the access files are not accepted.

Example of data transfer:

Name	Data 1
Mod4-DuB-TA110-15-DBNA-Swel-ENS-a	
Mod4-DuB-TA110-15-DBNA-Swel-ENS-b	
Mod4-DuB-TA110-15-DBNA-Swel-ENS-c	

Name	Data 3			

Example of complete data base:

Name	Data 1	Data 2	Data 3			

5 Accessibility to the database

During the project, the database will be accessible by all partners from the internal collaborative platform dedicated to the project (https://projectsworkspace.eu/sites/Team-Cables).

At the end of the project, this database will be partially accessible on the public website of the TeaM Cables project (http://www.team-cables.eu).

6 Conclusion

This deliverable defines the common database of the TeaM Cables project. Rules of data identification are given with data formats needed for the different techniques. Maintenance of this database will be ensured by AMU whereas data will be provided in group shipments by the partners in accordance with the data formats defined here.

During the project, the database will be accessible by all partners from the internal collaborative platform dedicated to the project.

At the end of the project, this database will be partially accessible on the public website of the TeaM Cables project.