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Polymers degradation under radiolysis : experimental adaptations of devices for irradiating samples dedicated to analytical methods perspectives.

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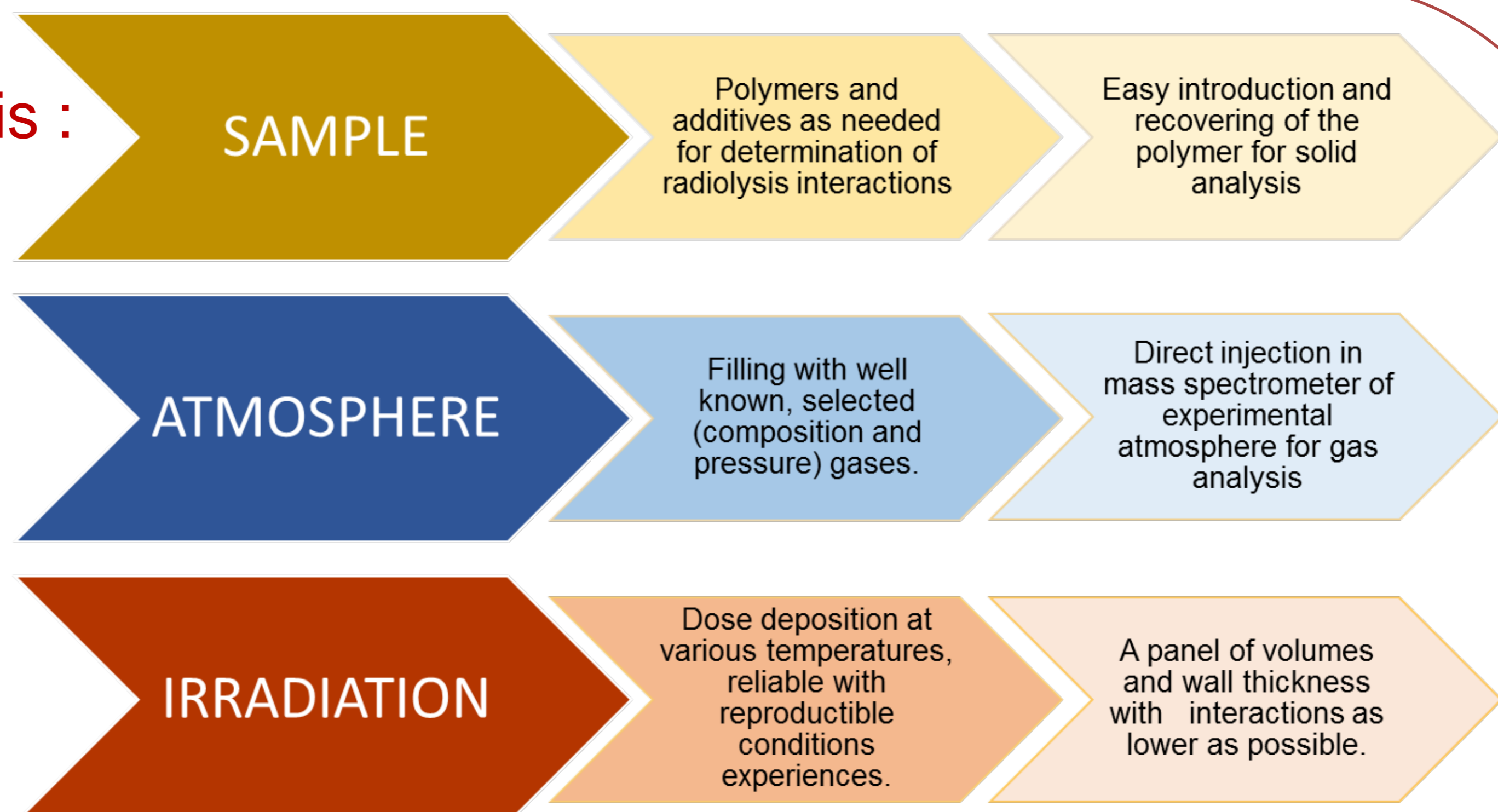
General context

- In the French nuclear safety context for managing waste packages long term behavior.
- Main objectives are analytical determination of degradation products generated after radiolysis.
- Various organic or inorganic materials, including polymers =
 - Production of potentially, explosive (hydrogen, methane...) or corrosive (HCl, HF,...) gases.
 - Chemical changes of the organic matter in waste packages due to radiations and evolution of interactions in the storage.

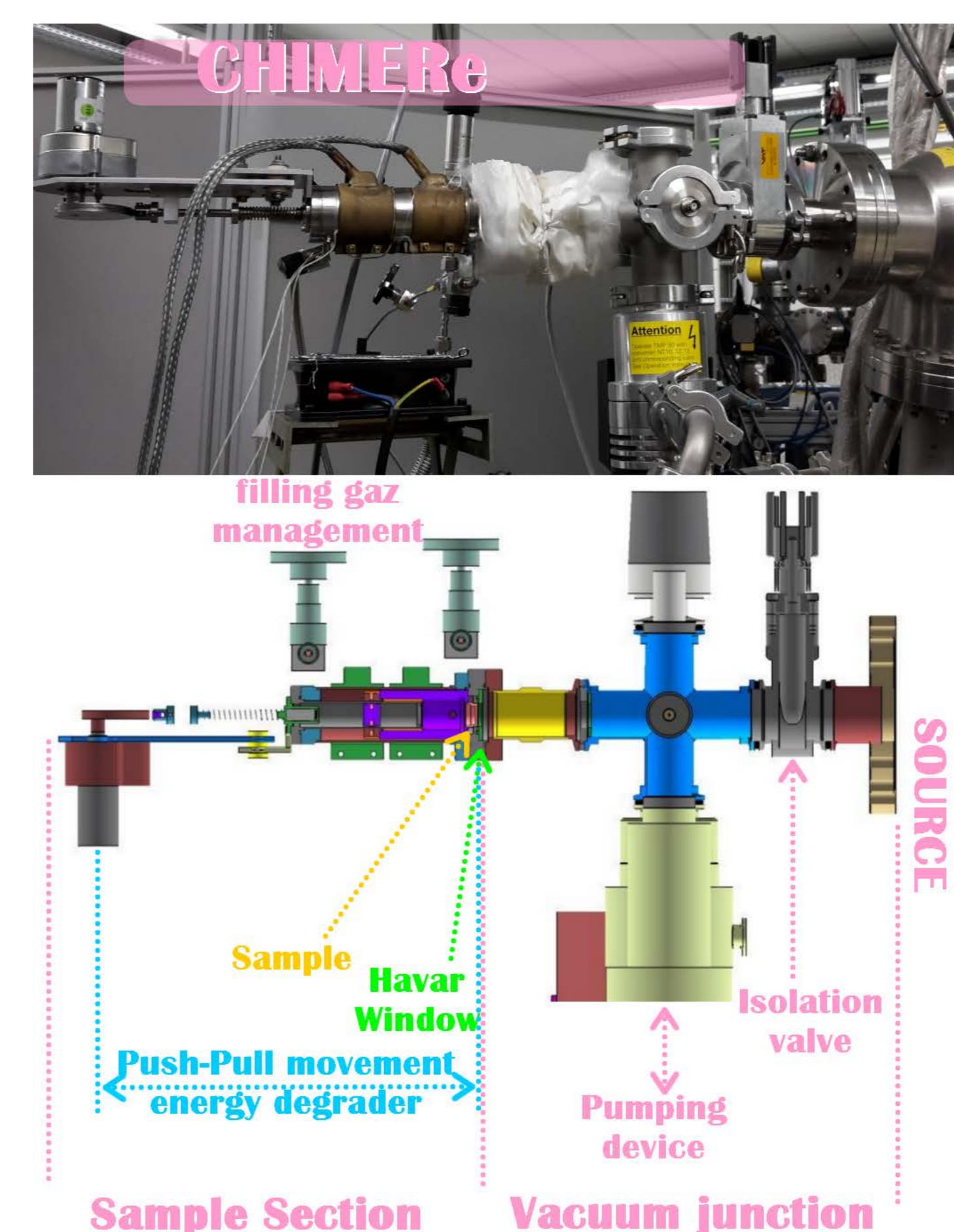
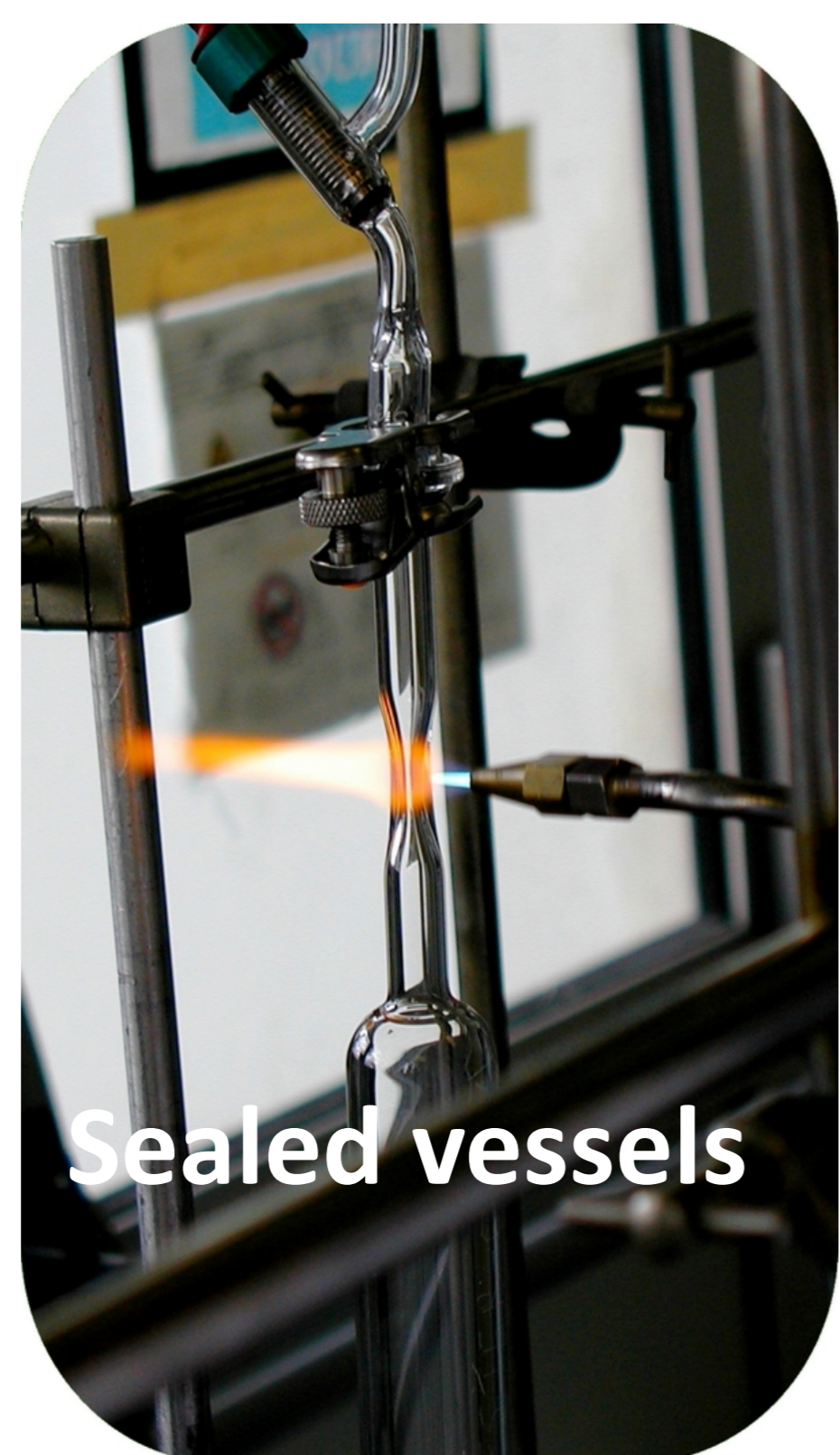
Studies context

- Problems have to be solved to obtain reliable data for long term predictions.
- Quantification of the gaseous compounds release, as a function of a ratio polymer/dose
 - Doses frequently higher than tens or one hundred of MGy => chemical composition of organic materials highly modified.
- Studies of materials under various irradiation conditions : various atmospheres, temperatures and different ionizing sources.

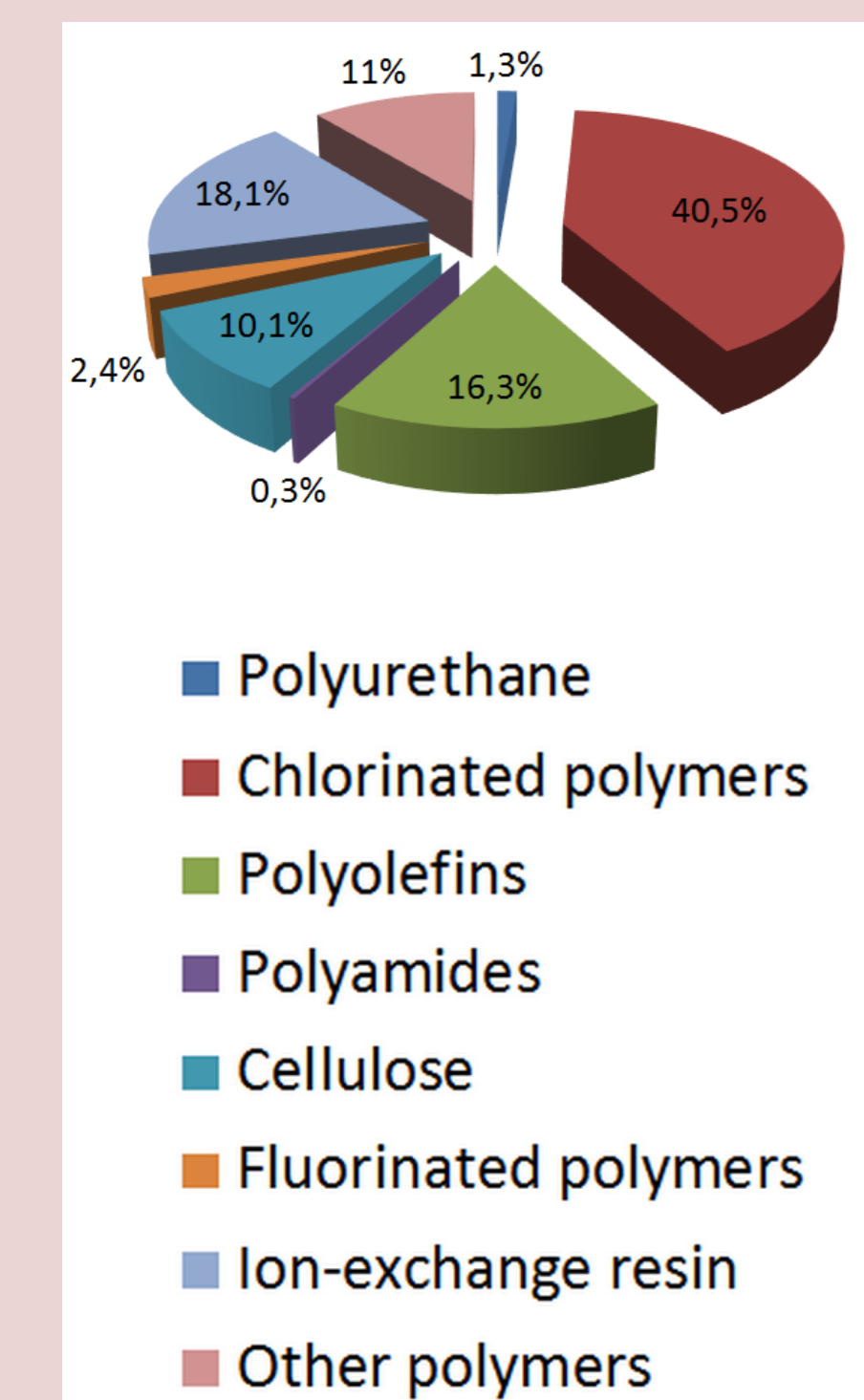
Preparation of adapted devices for irradiation and analysis :



Quartz or borosilicated glass vessels.



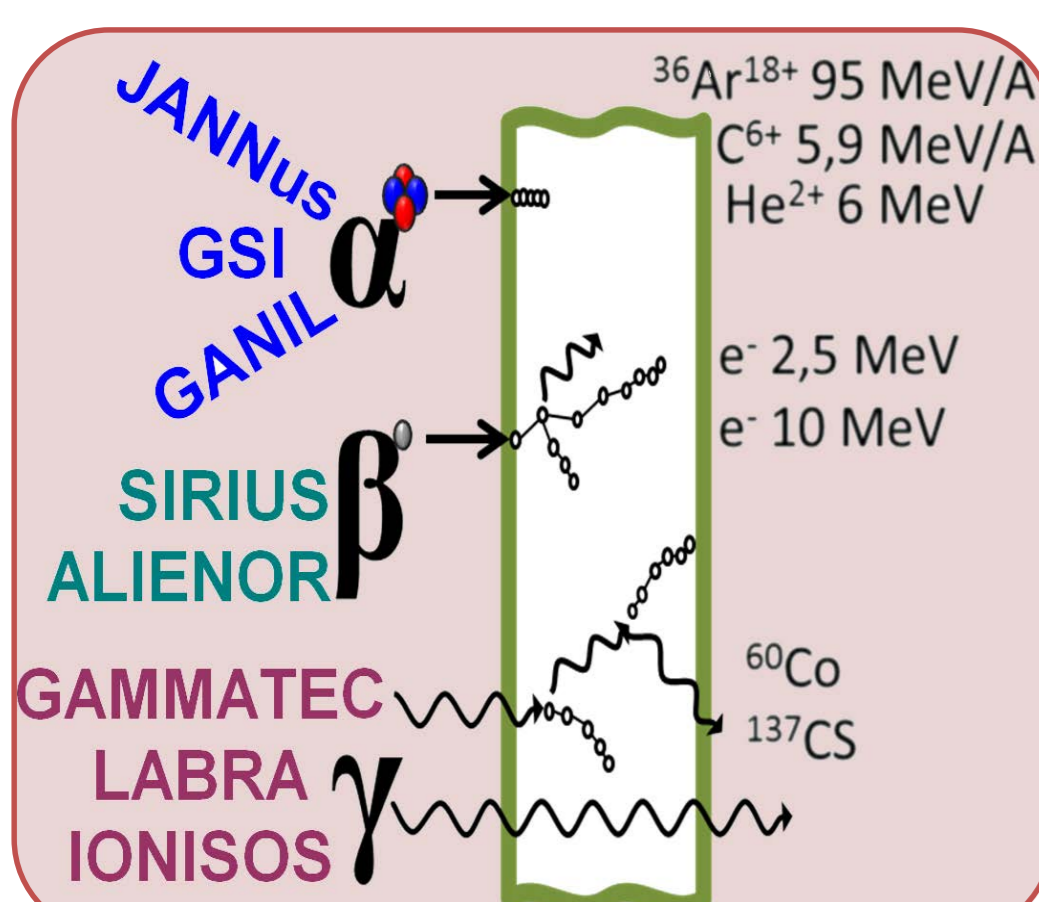
Polymers used in French electronuclear industry



Other molecules of interest

- Stearates
- Nitric acid
- Water
- Molecules used in nuclear industry

Many collaborations



Dose deposition in accordance with specific kind of the irradiating beam.

Doses consistent with waste storage different terms.

Managing the sample in accordance with the analytical objective, even more dealing with gas analysis and studying the influence of the irradiation dose on gas emission and/or oxygen consumption.



Managing with material + radiation interactions to focus the analytical result on the real objective. Dose deposition controlled, known atmosphere and pressure measurements realized, sample preparation (form, quantity, post gas analysis recovering of irradiated material), possible analyses of labile and solid compounds.

Analytical specialities found in DPC-LRMO

FTIR	COT	DART-MS
TGA-DSC	IC	TD-GC-MS
HR-MS	Gas Expertise	ASAP-MS



Perspectives

Contribution to database creation of the polymers radiation chemical yields with the improved knowledge in gas analysis of the DPC LRMO laboratory.

Contacts

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