UMT SafeMat

The first technological and research unit devoted to SAFE-BY-DESIGN materials for contact with food and bioproducts



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Context

What is an UMT?

UMT stands for "Unité Mixte Technologique", joint technological unit and is a partnership tool between a technical institute (LNE) and a public research unit (INRA/AgroParisTech).

A UMT is dedicated to technological research and aims to propose a unique and recognized entry in research and development for professional, industrial and public interlocutors. The results of the work must be operational, generalizable in the short and medium term and can be transferred as quickly as possible to the operators.

Its functioning resides in a synergy between researchers and engineers with a mutualization of technical and human means and a complementarity of skills.

LNE and INRA / AgroParisTech collaboration

The two entities have been collaborating for more than 10 years on the theme of packaging safety. Their collaboration has resulted in collaborative participation in national and European research projects: The two entities have been collaborating for more than 10 years on the theme of packaging safety. Their collaboration has resulted in collaborative participation in national and European research projects:

 Safe Food Pack Design (ANR, France) - "Development and transfer to industrial companies of the tools of back-engineering by modeling the transfers of the migrating molecules for the design of packaging in conformity with the European regulation",

Creabiom (BIP-ADEME, France). "Development of biodegradable multilayer materials with controlled properties by formulation with oil mill by-products".

The two partners also co-supervised 3 theses:

- Guillaume Gillet (2005-2008) "Development of a decision support tool for the control of the risk of chemical contamination associated with the use of materials in contact with food",
- Phuong-Mai Nguyen (2012-2014) "Food packaging safety engineering" and
- Audrey Gratia (2012-2014) "Evaluation of food safety and biodegradation of biosourced packaging"

They also have set up a mobility of researchers: "Training and transfer of robust methods

The LNE provides practical and operational industrial applications and also provides regulatory expertise and support to European authorities, health watch agencies, standards bodies and professional associations.

Missions

The mission of the UMT is to build a service offer in the certification of the safety of materials and packaging by proposing a "safe" engineering R & D offer for materials and packaging applicable to European or imported products in the EU and by responding to the new challenges of multi-materials, nanomaterials, biosourced or recycled materials, repeated use, flows ... It must also make it possible to accelerate the appropriation of predictive methods by the stakeholders in the packaging industry.

The UMT, through its training and transfer activities, must also contribute to the initial and ongoing training of industrial engineers and also to standards (NF, EN and ISO), guides of good practices in the use of tools and their implementation on an industrial scale. It should also help consolidate the rules for the management of materials in the medical and cosmetic sectors by extending to these areas the methodologies developed for food contact materials.

• TRUE FOOD (PCRD6, Europe) - "Traditionnal United Europe Food",

- HIGHQ-RTE (PCRD6, Europe) "Novel non-thermal process to improve quality and safety of RTE meals",
- MAP'OPT (ANR, France) "Composition, gas dynamics and optimization of the protection of foodstuffs in modified atmosphere packaging",

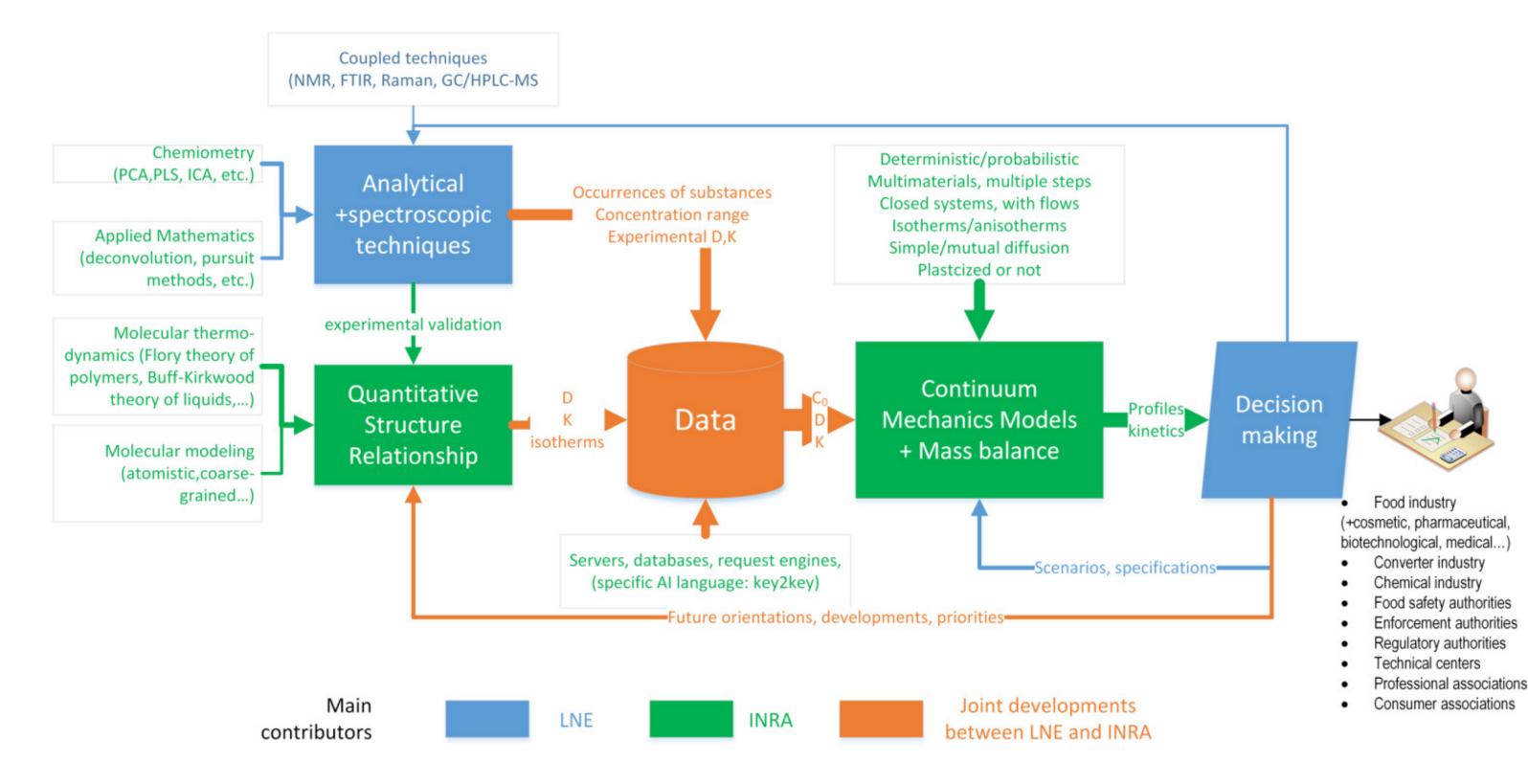
and codes of calculation for the prediction of contamination of food packaging".

Complementarity

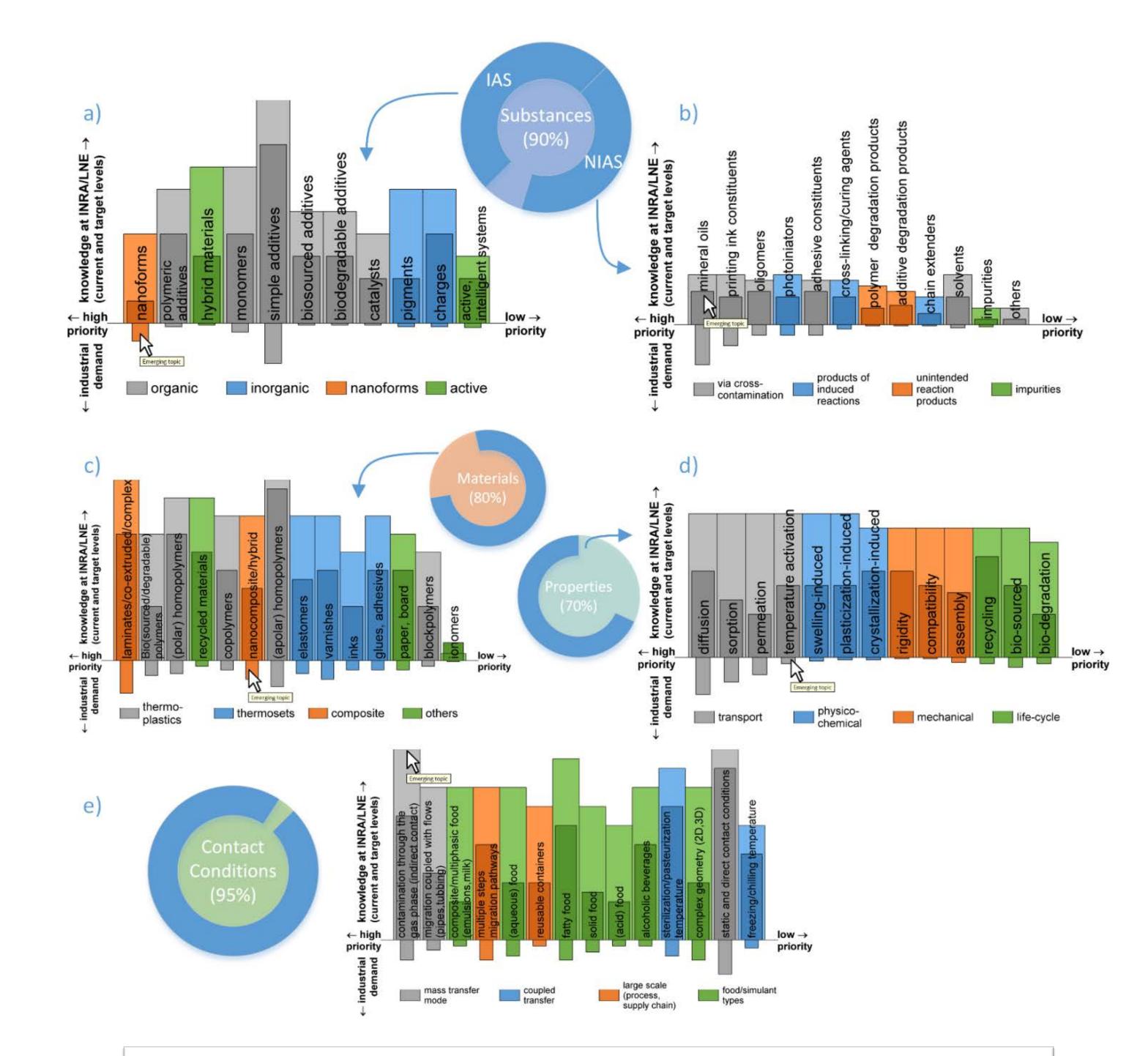
INRA / AgroParisTech favors generic and methodological approaches such as codes and calculation methods, new methods of analytical chemistry and characterization of container / content interactions and transfer coefficients. It develops multi-scale modeling and simulation tools to calculate transport and thermodynamic properties, to assess the risk of contamination in a deterministic or probabilistic context by packaging throughout their life cycle. Life and to assess consumer exposure to these substances.

Packaging safety approach

Overview of the predictive approaches developed between INRA / AgroParisTech and the LNE for decision-making on the risks associated with the use of contact materials.

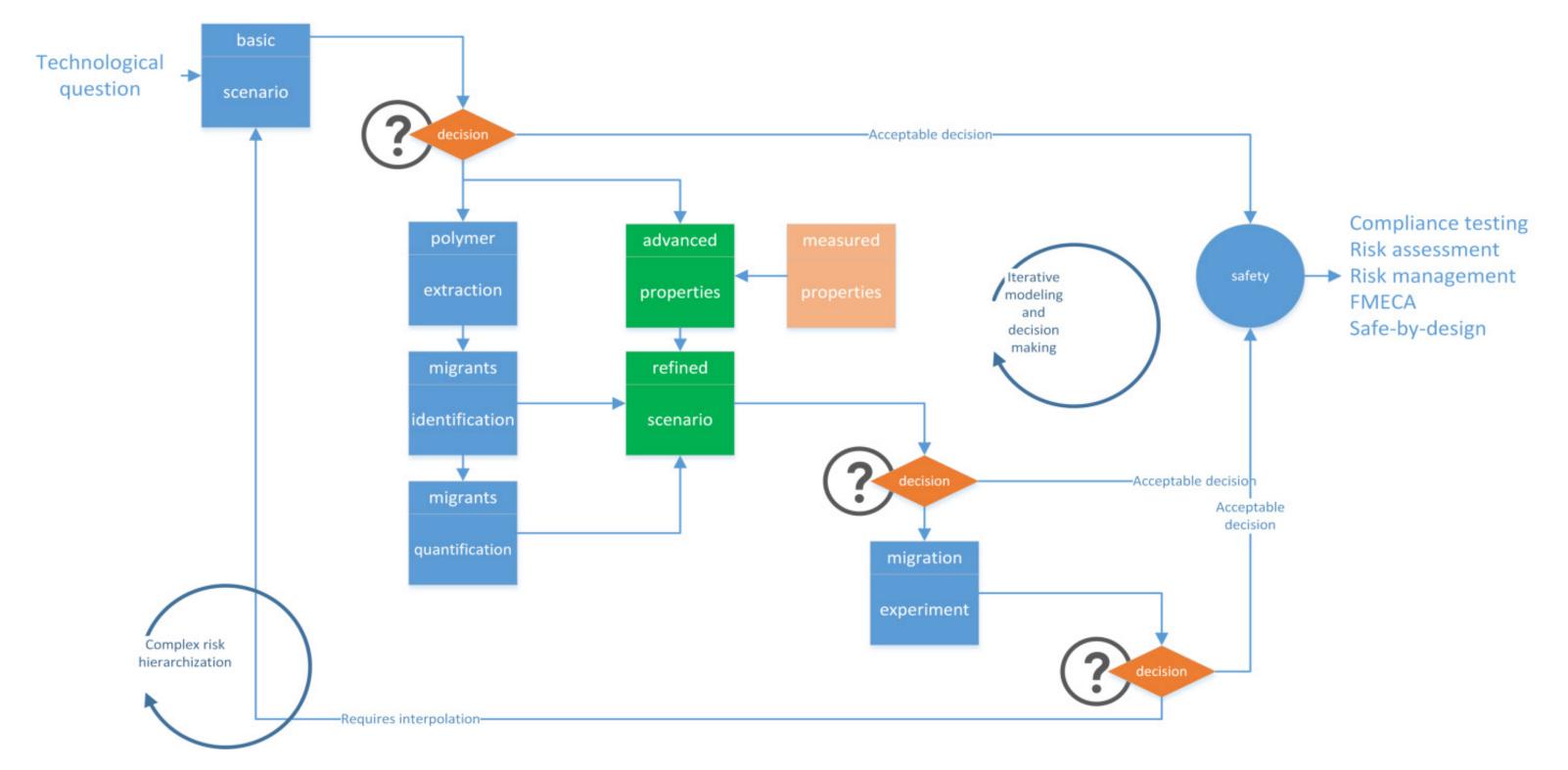


List of formalized knowledge in current decision-making tools (dark bars) or still to be acquired (light bars) through INRA / AgroParisTech-LNE joint research actions to satisfy industrial questions.



It is essentially an integrated approach combining databases, modeling at various scales and decision-making for a variety of contexts.

Principle of integrated approaches developed by INRA / AgroParisTech and LNE for decision-making in the field of contact materials safety.



Circles identify the exhaustiveness of reported situations for food contact: (a) IAS = Intentionally Added Substances; (b) NIAS = Non-Intentionally Added Substances; (c) materials in contact with foods implemented; (d) physico-chemical properties affecting contamination; (e) list of modes of contamination.

Priorities are defined in relation to the initiated or envisaged sequencing of research actions. By way of comparison, the levels of the current industrial demands are given by the lower histograms (turned downwards). Sectoral representations assess the level of coverage of approaches as expected over the next four years.

Work axis

Axis 1. Capitalization and knowledge creation - Consolidation of the engineering approach through acquisition, capitalization and creation of knowledge

- Molecular thermodynamics: partition coefficients, diffusion coefficients and their activations
- Identification, quantification and management of unintentionally added substances (NIAS)
- Modeling of transfers for repeated contacts (content / material) and in the presence of flows
- Modeling the transport of nanoparticles

Axis 2. Development of trials and experiments - Development of predictive approaches and decision support tools

- Consolidation and validation of predictive schemes on real cases (chemical structures, geometries, thermodynamic conditions, ...)
- Measurements of thermodynamic properties and transport coefficients
- Description of the mechanisms and phenomena of contamination studied little (in gas phase, with flow, with reaction, ...)

Axis 3. Technological transfer and dissemination - Transfer and dissemination of knowledge and new practices to actors in the supply chain (packaging and food)

- Open-source knowledge and open-source software tools
- Initial and ongoing training for packaging safety stakeholders
- Participation in regulatory and health assessment bodies (France, Europe, USA)
- Development and consolidation of national and European partnerships
- Communications : MATBIM 2017, LNE Packaging Forum

Conclusion and contacts

The SAFEMAT Joint Technology Unit allow the creation of a partnership of excellence "Safety of materials and packaging in contact" focused on the simulation of transfer phenomena that will answer the following issues.

Scientific Issues

- To allow the academic actors and technical centers to have robust methods of evaluation of the phenomena of transfer in the materials by molecular modeling.
- Methods should be based on:
- demonstrators for the evaluation of non-intentionally added substances (NIAS) and nanoparticulate substances,
- databases on the physicochemical properties of substances and on the design of molecules with regard to their diffusion (safe by design).

Industrial issues

- Provide French industry with tools for competitiveness in predicting regulatory compliance of packaging at early stages of product design, particularly with the emergence of biosourced, biodegradable, nanocomposite materials and suitable for or produced by recycling.
- Assist in the development of good industrial practices (transfer of standards from the food sector to other fields: medical, biotechnology, cosmetics, construction, fireproof textiles...).
- Have training modules incorporating tools and good practices adapted to industrialists, packaging schools, specialized masters and supervisory authorities.
- Train experts from industry, technical centers and regulatory bodies to accompany the acceptance of compliance prediction by calculation.
- > Support standardization and regulatory actions at European and international level.

Social Issues

- Contribute to the topic of the environmental impact of materials and packaging (ecodesign, lifetime, end of life, recycling, reuse, biodegradability), safety of multi-purpose materials (eg tubular product) and new technologies (management of emerging risks associated with polymeric materials : active packaging, nanocomposites and bioplastics).
- Contribute to the recognition of the French position in the bodies in charge of risk management in the field of safety of materials and packaging at European level.

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