Research Collaboration between CP2M-Michelin within the CHEMISTLAB
(a joint laboratory between the CP2M and Michelin)

# Synthesis of sustainable functional elastomers

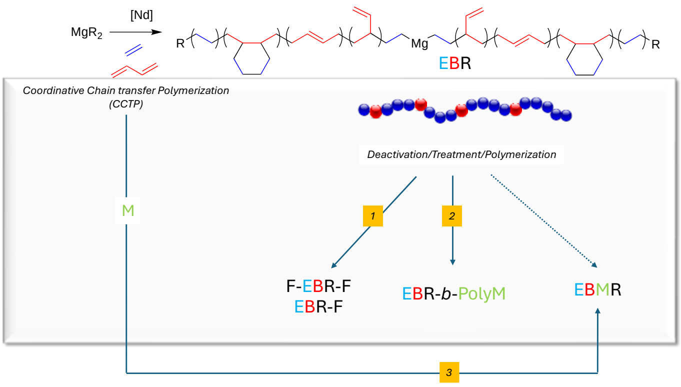
**SUJET OUVERT AU CONCOURS DE L'ED DE CHIMIE DE LYON**

***https://www.edchimie-lyon.fr/contrats/sujet-ouvert-aux-concours-de-l-ed.html***

Our group is involved in a research collaboration with Michelin tyre company for more than 25 years. The knowledge gained over the years on the copolymerization of ethylene and butadiene via coordination-insertion led to a new class of elastomers called ethylene-butadiene rubber (EBR).[1] This new polymer and the macromolecular structures based on hold great promise in the field of material particularly for the design of tyres with improved performances. Within CHEMISTLAB, the ambition is to create new generations of high-performance elastomers with applications in tyres in particular. In addition, CHEMISTLAB's research themes are in line with Michelin's strategy[2] of promoting more sustainable mobility through the development of high-tech, high-performance, potentially bio-based and recyclable/reusable materials.

According to these lines, the goal of the present project co-funded by Michelin is to develop synthetic tools that would allow to develop new EBRs according to three different ways.

The first one will be dedicated to the design of functionalized EBR chains. This is made possible by already established strategy[3] that take advantage of the living nature of the copolymerization of ethylene and butadiene to selectively introduce at the end and/or the beginning of the chains specific reactive groups. Among them, those able to interact with other components being part of the formulation of the elastomers used to produce a tyre are of particular interest as they might favor cohesion with the final tyre.




In a second strategy, the reactivity of the carbon-metal bond present on all the EBR chains will used to advantageously reinitate the polymerization of different class of monomers to produce block copolymers based on EBR blocks. This will again be performed by building on the achievements of the laboratory in this topic[4] and by selecting blocks of particular interest. Eventually, a last strategy will be dedicated to the identification of comonomers that could be used in combination with the ethylene and butadiene to lead to functional EBR carrying side chain reactive groups. Among the many advantages of the last two strategies are the development of elastomers that can be recycled and injected in 3D printing.[5]

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[1] V. Monteil, R. Spitz F. Barbotin, C. Boisson *Macromol. Chem. Phys.* **2004**, *205*, 737
[2] https://www.cp2m.org/research/5-chemistlab.html
[3] N. Baulu, M.-N. Poradowski, L. Verrieux, J. Thuilliez, F. Jean-Baptiste-dit-Dominique, L. Perrin, F. D'Agosto C. Boisson *Polym. Chem.*, **2022**, *13*, 1970
[4] M. Langlais, N. Baulu, S. Dronet, C. Drire, F. Jean-Baptiste-dit-Dominique, D. Albertini, F. D'Agosto, D. Montarnal, C. Boisson *Angew. Chem. Int. Ed.* **2023**, e202310437. N. Baulu, M. Langlais, R. Ngo, J. Thuilliez, F. Jean-Baptiste-dit-Dominique, F. D'Agosto, C. Boisson *Angew. Chem. Int. Ed.* **2022**, e202204249
[5] https://www.dailymotion.com/video/x5rewrg