

## Understanding the reactivity of mechanical force-responsive systems: a (macro)molecular engineering approach



Timeline | 09/2024 to 08/2027



ICIQ People | [José A. Berrocal Group](#)



Budget | 125.000 €



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Generación Conocimiento 2023

### SUMMARY

ForcING is a research project operating within the context of polymer mechanochemistry, a two-decade old research field that studies how mechanical forces propagate at the molecular level within polymeric materials. Key chemical substances for this type of study are mechanophores, species that are sensitive to mechanical forces and produce physicochemical responses as a result of mechanical stimulation. Thus, mechanophores serve the function of force sensors through which we can infer about the mechanical state (and mechanical history) of a material. Despite the tremendous progress obtained in the past two decades, polymer mechanochemistry is still far from having a molecularly detailed knowledge about mechanophores activation. ForcING proposes to fill this fundamental gap by creating new mechanophores capable of changing the color of absorbed light or light emitted upon mechanical stimulation, i.e., mechanochromism. Such new mechanophores will be synthesized and incorporated into polymer matrices of different types and properties, exploiting a wide range of chemical functionalizations. This will allow us to create libraries of molecules and materials that will define a "chemical space", and we will explore this chemical space primarily to quantitatively assess the efficiency of the mechanochemical activation of the realized mechanophores. The quantification will be performed with state-of-the-art laboratory setups that will give the possibility to simultaneously measure mechanical and optical properties of the polymeric material under mechanical deformation. This last description best summarizes the high interdisciplinarity of ForcING, a project in which organic and polymer synthesis, various molecular and macromolecular characterization techniques, and materials science are merged.

