## Understanding the exfoliation processes of Graphene and Related Materials: from a single piece to a standardized production.

The understanding the exfoliation processes of Graphene and Related Materials (GRMs) is a key-point for the upscaling production of such materials. Focussing on Liquid Phase Exfoliation approaches, we visualized and characterized the different processes known so far for exfoliation and intercalation of 2D layered materials. Aiming at the fundamental understanding of these processes and possibilities for optimizations in terms of composite production (such as GRM-host interactions) is mandatory to provide standardised approaches to manage such materials at industrial scale.

For this reason, we explored two routes:

• New scalable protocol of electrochemical exfoliation: new routes to produce GRMs compatible with large-scale industrial application. Tunable properties of the produced materials. Step-by-step *in-situ* and *ex-situ* monitoring to minimize the defects without significant loss of processability or properties.

• Beyond solution monitoring. Small molecules as surfactants to stabilize GRMs in lowboiling point solvents Direct understanding of solution properties. Development of experimental protocols and mathematical/statistical tool dedicated to the quantitative analysis of large scale GRMs.