

## Diffusion-induced instabilities in soft solid sheets

Active-elastic instabilities are common phenomena in the natural world where they have the aspect of sudden mechanical morphings [1]. Frequently, the driving force of the instability mechanisms has a chemo-mechanical nature which makes the instabilities very different from the standard elastic instabilities.

In this presentation, the active-elastic instability occurring in a spherical gel bulk or with a cavity during a de-hydration process will be described. The description is given from two point of view: numerics and analytics. Firstly, the outcomes of a few numerical experiments based on a stress-diffusion three-dimensional model will be illustrated; they allow to glance at the phenomenon. Secondly, the implemented study is presented. It is carried on from a chemo-mechanical perspective through a few simplifying assumptions which allow to derive a semi-analytical model which takes into account both the stress state and the water concentration into the walls of the shell at the onset of the instability. It is shown as the semi-analytic model matches very well the outcomes of the numerical experiments far from the initial regime; the ranges of validity of the approximated analytical model are also discussed [2].

### REFERENCES

1. A. Sakes et al., "Shooting Mechanisms in Nature: A Systematic Review." PloS ONE 11(7), e0158277, 2016.
2. M. Curatolo et al., "Dehydration-induced mechanical instabilities in active elastic spherical shells", Proceedings of the Royal Society A **477**: 20210243, 2021.