Context

**Paper industry:**
- Reduction of grammages with constant mechanical properties.
- Functionalization of papers in order to obtain specific surface properties and for new applications for thin paper.

But, it is mandatory to keep the quality of the paper:
- Wrinkles may appear during functionalization of low grammage papers.
- Non-conformities and downgrading of the products.

**Objectives:**
- Obtaining fibrous supports with known characteristics.
- Development of multi-scale techniques for wrinkles characterization.
- Process simulation – modeling.

**Funded by Ecole Doctorale IMEP-2**

Methods

**Paper - coating characterization:**
- Mechanical properties, rheology and sedimentation studies.

**Understanding of the wrinkles formation:**
- **Microscopic and macroscopic tools.**

**Modelling and simulation:**
- Understand the relationship between water absorption and paper mechanical properties.
- Study of temperature heterogeneity.

Understanding of the wrinkles formation during the coating functionalization of low grammage fibrous materials: a multiscale approach.

**Results**

**Understanding of the wrinkles formation:**
- DIC system to see wrinkles formation.

**Out-of-plane displacement dz during a tensile test**
- Impact of critical web tension $T_{cr}$ and misalignment angle $\theta$ on wrinkle appearance:

$$T_{cr} = \frac{2\mu L}{\varepsilon \varepsilon Z} \sqrt{\frac{E_x E_y}{3(1-\nu_x \nu_y)}}$$

$$\theta = \frac{6T_{cr} \alpha^2}{E_x L^2}$$

**Process control and monitoring:**
- Highlighting of 9 areas to facilitate coating process control (from A to I).

**Conferences:**