

# Séminaire LIONS



**Jeudi 12 juin 2014 à 11h00, lieu à préciser**

**! Salle inhabituelle !**

## **Nanoparticle solutions as adhesives for gels and biological tissues<sup>1</sup>**

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Adhesives are made of polymers because, unlike other materials, polymers ensure good contact between surfaces by covering asperities, and retard the fracture of adhesive joints by dissipating energy under stress. But using polymers to 'glue' together polymer gels is difficult, requiring chemical reactions, heating, pH changes, ultraviolet irradiation or an electric field. A simple and efficient way to assemble gels is desirable for many emerging technological and medical applications such as microfluidics, actuation, tissue engineering and surgery.

Here we show that strong and rapid adhesion between two hydrogels can be achieved at room temperature by spreading a droplet of a nanoparticle solution on one gel's surface and then bringing the other gel into contact with it. The concept relies on the nanoparticles' ability to adsorb onto polymer gels and to act as connectors between polymer chains, and on the ability of polymer chains to reorganize and dissipate energy under stress when adsorbed onto nanoparticles. This approach is illustrated using both synthetic or natural hydrogels, as Poly(*N,N* dimethylacrylamide) (PDMA) and gelatine respectively.

The method enables to bond, after tens of seconds of contact time, gels that have the same or different chemical nature or different rigidities, using various solutions of nanoparticles.

1. S. Rose, A. PrevotEAU, P. Elziere, D. Hourdet, A. Marcellan, L. Leibler, *Nature*, 505, 7483 (2014)