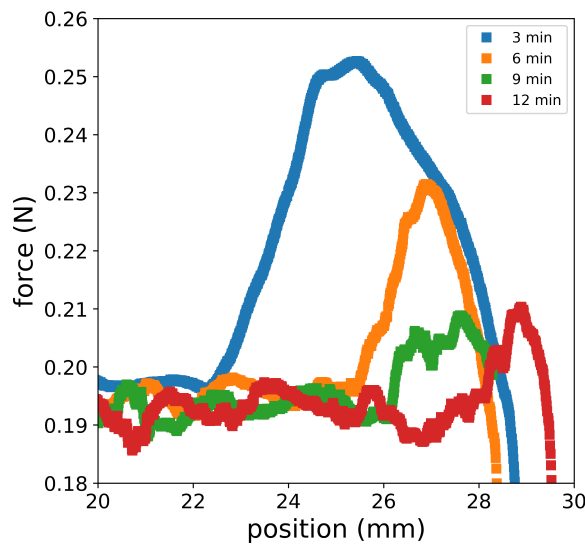

Adhesion of cement pastes

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In this project, we will measure the adhesion energy between two layers of pastes consisting of aggregated particles suspensions. [Level: L3/M1/M2 with background in Physics]

Cement pastes at early ages can be viewed suspensions of mineral particles that progressively aggregate with time. As a consequence, their bulk mechanical properties, such as elasticity and viscosity, evolve. But their surface properties also change. For example, it is well known that the adhesion of a fresh cement paste onto a solid substrate is in general much stronger than the adhesion of a set cement paste. Nevertheless, the understanding of this behavior is very poor : we can see the system as two networks of aggregated particles that deform and interpenetrate when they are place in contact or out of contact. We wish to describe properly the forces underlying these processes. We have built a force setup in order to measure the forces between two layers of attractive particles suspensions. The goal of this projetc is to carefully measure the adhesion of cement pastes : a cement layer will be deposited at the surface of a sphere and will be put in contact to a planar layer. The evolution of the normal forces while a normal displacement is imposed to the sphere will be monitored. We will in particular study the fracture of the contact and we will quantify the fracture energy released between two concentrate suspensions of different ages, that is of different elasticities, viscosities and surface properties. We will study the evolution kinetics of the adhesion energy as a function of the age of the pastes and of their difference in age.



Adhesive force exerted between a fresh cement paste and a cement paste of different setting times : 3 min, 6 min, 9 min and 12 min, as a function of the distance between the two paste layers.