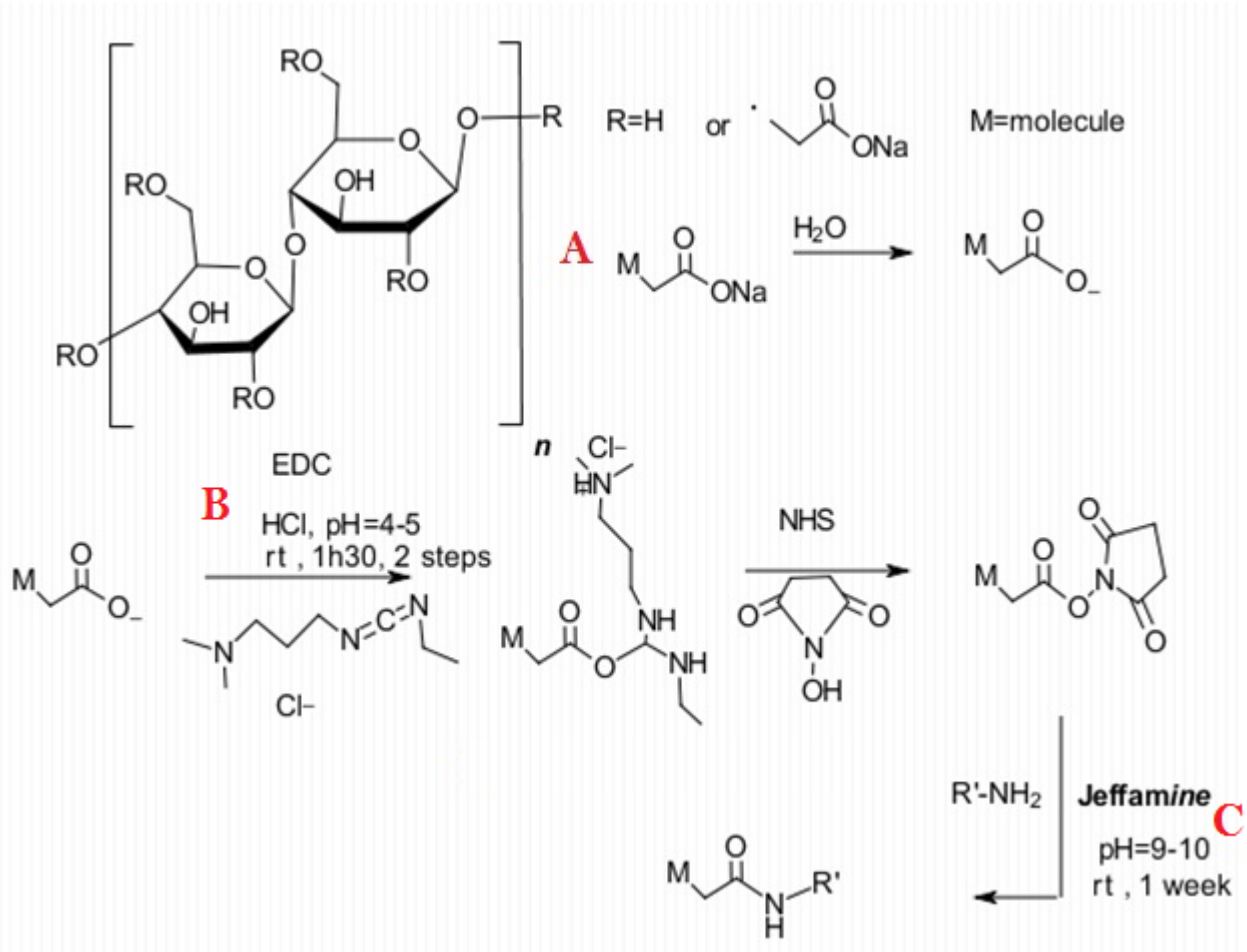
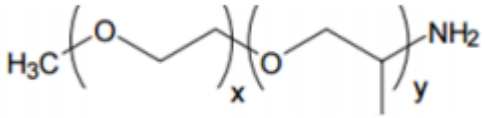
Figure 1: Plan of of the principle of the synthesis



Cellulose is first dissolved in water(**A**). EDC and NHS are added all at once to prepare the intermediate ester(**B**). The reaction must be carried out on the carboxylate ion, but because NHS is not very stable and less reactive in a basic or neutral environment, the reaction is carried out at pH = 4-5. Since the intermediate is unstable, the reaction is not prolonged. In a second step(**C**), the reaction with Jeffamine (primary amine) is more effective in a basic environment.

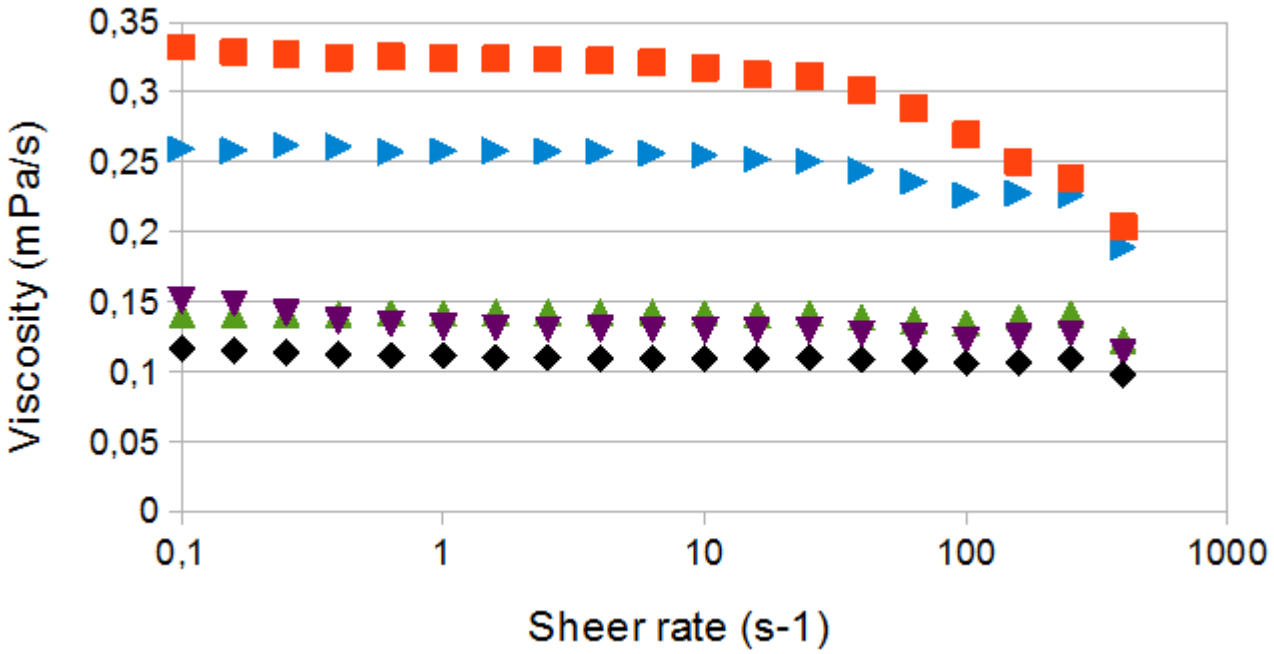
Figure 1': Structural formula of the Jeffamine



x=1 and y=9

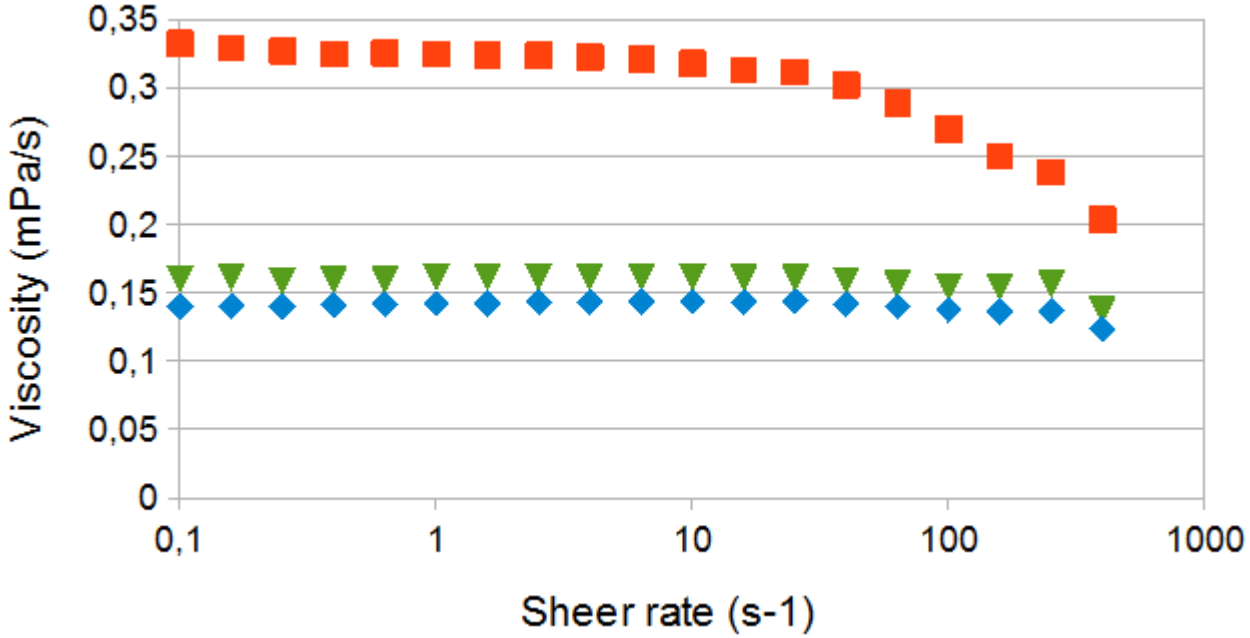
Figure 2: Viscosity depending on sheer rate. Evolution of viscosity after reaction and purification at several Jeffamine concentrations

2.a



2.a Several samples of the same mother solution of cellulose (purple) react with different amount of Jeffamine: 0eq (**red**), 0,1eq (**black**), 0,5eq (**purple**), 1eq (**green**), 3eq (**blue**). Viscosity has decreased after the reaction with Jeffamine and still has the same shape. It also seems to increase with the amount of Jeffamine added, but this could be due to the high intrinsic viscosity of the Jeffamine excess.

2.b

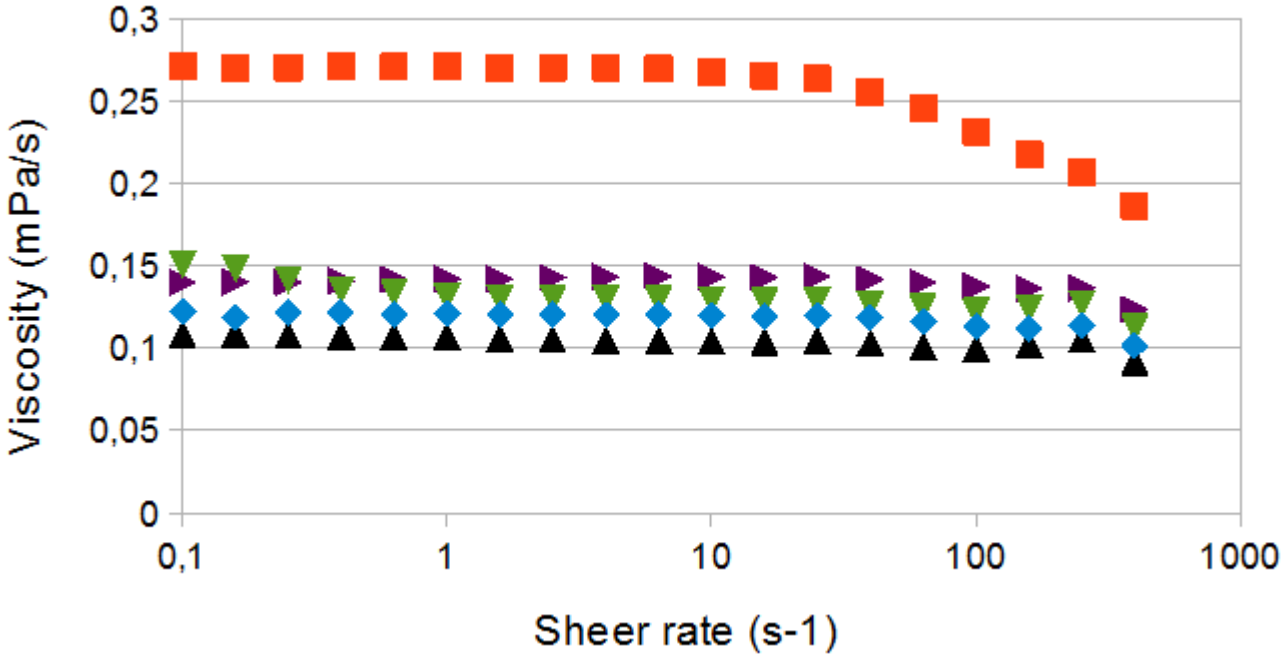


2.b Indeed, extracting Jeffamine after reaction with a dialysis and lyophilisation brings curves closer. The reaction has a significant effect on viscosity, but the ammount of Jeffamine used does not have a great impact at that equivalents.

0eq (**red**), 0,5eq pure (**blue**), 3eq pure (**green**).

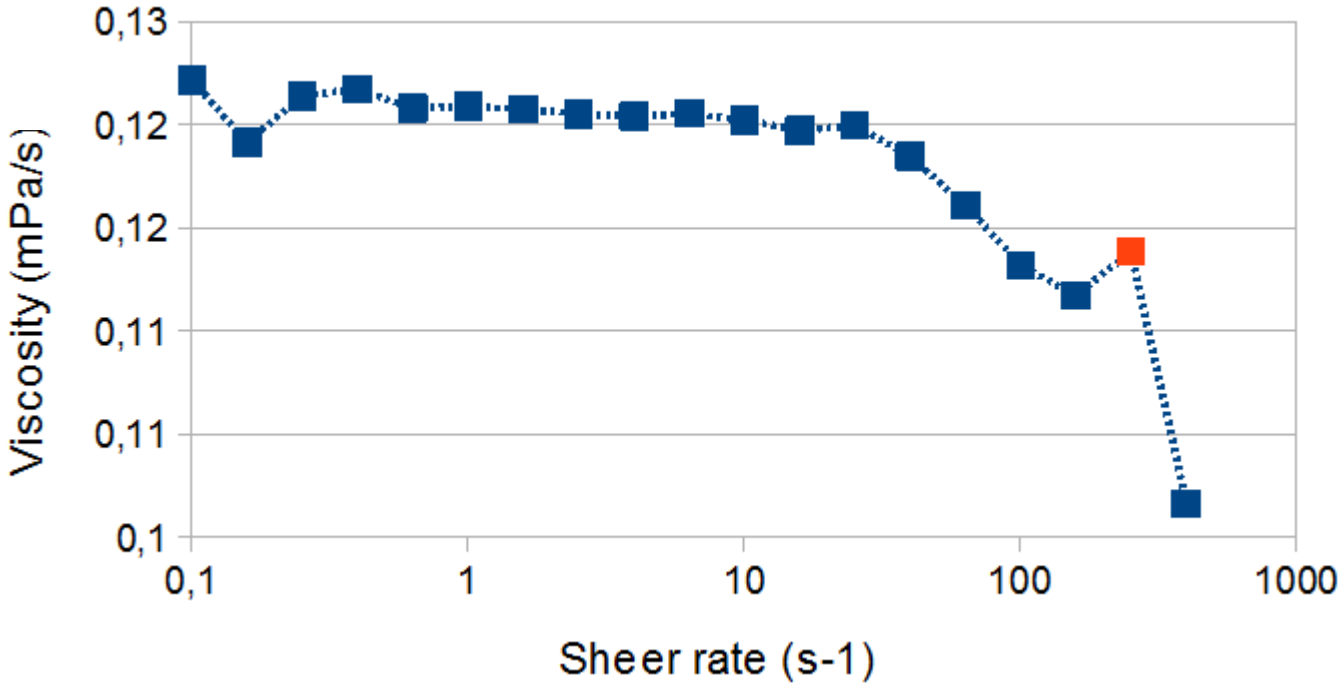
Figure 3: Viscosity depending on sheer rate. Reproducibility of the reaction

3.a



3.a Several identical samples react in the same conditions and their viscosity is compared : 0,5eq for all samples. Reference with no reaction (**red**), pure one (**blue**), three impure samples (**green**, **purple**, **black**). The viscosity decrease effect is globally the same, but there seems to be a reproductibility problem (up to 25% viscosity gap on the plateau excluding the purified sample).

3.b



3.b This effect can only be seen by watching a single curve at a time (0,5 eq without purification). After and before the reaction, all samples have a viscosity fall at around $30s^{-1}$. After the reaction, a viscosity peak appears at $250s^{-1}$ on every sample, with a local increase of around 5% of the viscosity of the plateau. It is important to notice that, despite the value of viscosity of their plateau, the 5% peak always have the same shape on every curve.