



# Rheological, Thermal and Mechanical Characterization of Toughened Self-Healing Supramolecular Resins, Based on Hydrogen Bonding

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## Rheological measurements

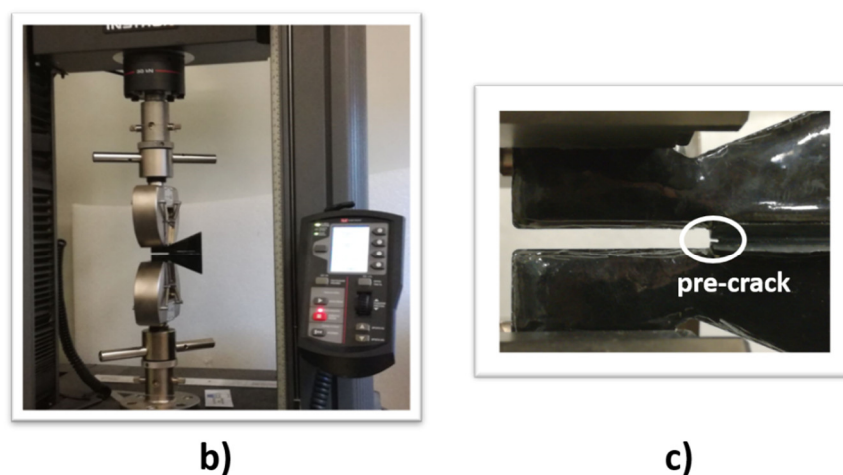
Rheological measurements of the functional uncured formulations were performed with a Physica-MCR301 (Anton-Paar) rotational rheometer. Small amplitude oscillatory shear measurements were performed at different values of temperatures.

## Electrical properties

DC volume conductivity measurements were carried out by using disk-shaped samples of about 2 mm thickness and 50 mm diameter; using a circular electrode with a diameter of about 22 mm. The system employed for the measurements was remotely controlled by the software LABVIEW®. It is constituted of a shielded cell with the control of temperature, of multimeter Keithley 6517A with the function of voltage generator (max. \_1000 V) and voltmeter (max. \_200 V) and the ammeter HP34401A (min. current 0.1 mA) for specimens above the EPT. For samples below the EPT, the system is constituted only of multimeter Keithley 6517A with the function of voltage generator (max. \_1000 V) and pico-ammeter (min. current 0.1 fA).

## Self-healing efficiency evaluation

Figure S1 illustrates the samples with TDCB geometry clamped and located in the dynamometer. Samples have been loaded at first failure and then unloaded, allowing the crack face to come back into contact and after 24 h have been tested again.



**Figure S1.** (a) Virgin sample (EP-0.5CNT-M) with TDCB geometry located in the instrument for fracture tests; (b) enlargement of photo a, showing the pre-crack performed on the sample before the test.

### Rheological characterization

**Table S1.** Values of complex viscosity ( $\eta^*$ ) at different temperatures for EP blend.

Temperature [°C]	$\eta^*$ [Pa*s]
25	1726.552
50	22.89545
75	1.668182
90	0.610136

**Table S2.** Values of complex viscosity ( $\eta^*$ ) at different temperatures EP blend loaded with healing molecules.

T [°C]	$\eta^*$ EP-DBA [Pa*s]	$\eta^*$ EP-T [Pa*s]	$\eta^*$ EP-M [Pa*s]
25	11100	-	2550
50	92,8	24,5	37,6
75	6,43	2,04	2,63
90	2,87	0,77	1,02

### Thermal analysis

**Table S3.** TGA data of cured samples in air and nitrogen flow.

Sample	TGA in Air Flow			TGA in Nitrogen Flow		
	Td <sub>5%</sub>	Td <sub>50%</sub>	Residue (900 °C)	Td <sub>5%</sub>	Td <sub>50%</sub>	Residue (900 °C)
EP	363.3	444.4	2.6	348.4	411.1	18.2
EP-0.5CNT	356.0	444.3	0	338.6	413.3	20.0
EP-0.5CNT-DBA	365.8	453.3	4.2	359.2	413.0	20.0
EP-0.5CNT-T	316.1	435.2	0	340.8	413.6	9.8
EP-0.5CNT-M	335.4	454.5	2.7	336.2	431.7	9.8