Report purpose :

Case study of the ageing behavior of polymerized PR700 and PR751 resins when they are continuously immersed in various fluids at room temperature.

Test conditions :

Stabilized test samples have been immersed into specific fluids for a period of 184 days. During this period, their weight have been regularly checked. The involved fluids are :

- Gasoline, brake fluid (DOT4), motor oil (10W40 SAE API/SF)

A second set of test samples have been immersed for 90 days into a MEK type solvent, and in the following aqueous solutions :

- Tap water, sea water, 10 percent sulfuric acid, 10 percent hydrochloric acid, 10 percent hydroxide sodium and car windscreen washer.

Results are given by mass variation expressed in %.

Conclusions :

After a 184-day test in liquids of hydrocarbon type, both PR700 and PR751 show a mass variation that is less than 1%.
Those data give a positive sign toward further considering the use of those materials in an environment where the will be exposed to automobile fluids.

After 90 days of immersion in various neutral aqueous solutions, or diluted acids, or diluted bases, the mass variation is below 2%.
The test samples don't show marks of any deformation nor any particular degradation. The materials have a good resistance to these solutions.
After 90 days, the mass variation of PR700 immersed in a MEK type solvent is about 6%. On the same period, PR751 mass variation is only 1%.
For a short-time exposure to MEK type solvent, PR700 can be used. For a longer exposure, PR751 is more suitable.

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Test samples preparation and dimensions :

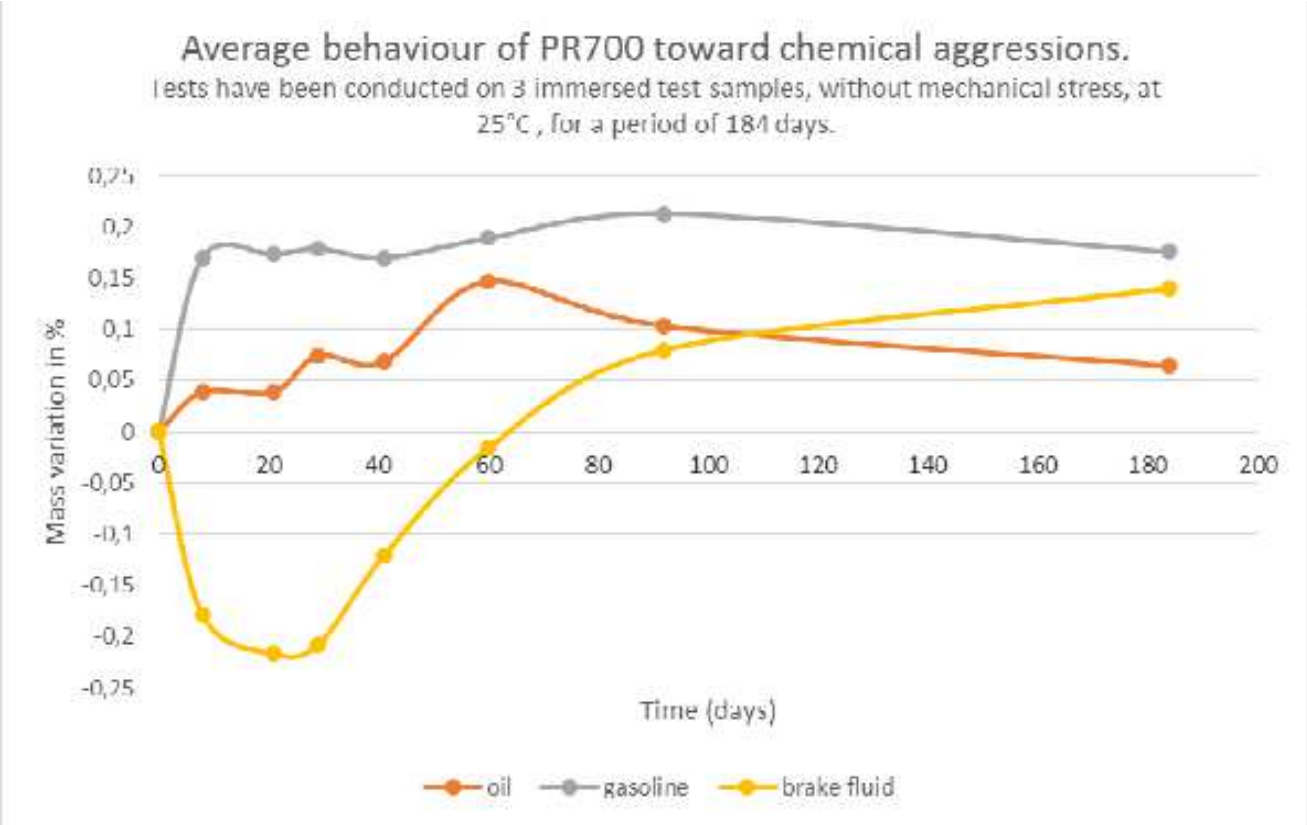
Test samples dimensions : 4 X 10 X 100 mm

The resins mixes have been done according to the materials technical datasheet, degased in a vacuum chamber and eventually casted into preheated at 70°C aluminum moulds.
Moulds have then been placed in an oven at 70°C for 2 hours, then for 1 hour at 100°C, then for 2 hours at 120°C.
Finally, the test samples have been stabilized at room temperature for 24 hours.

Test processing conditions :

Each of the test sample is precisely weighted before being immersed in a given fluid.
Three test samples are immersed in each fluid.
The mass variation measurements in hydrocarbon fluids have been done during a period of 184 days.
The mass variation measurements in aqueous solutions have been done during a period of 90 days.

Obtained results with PR700



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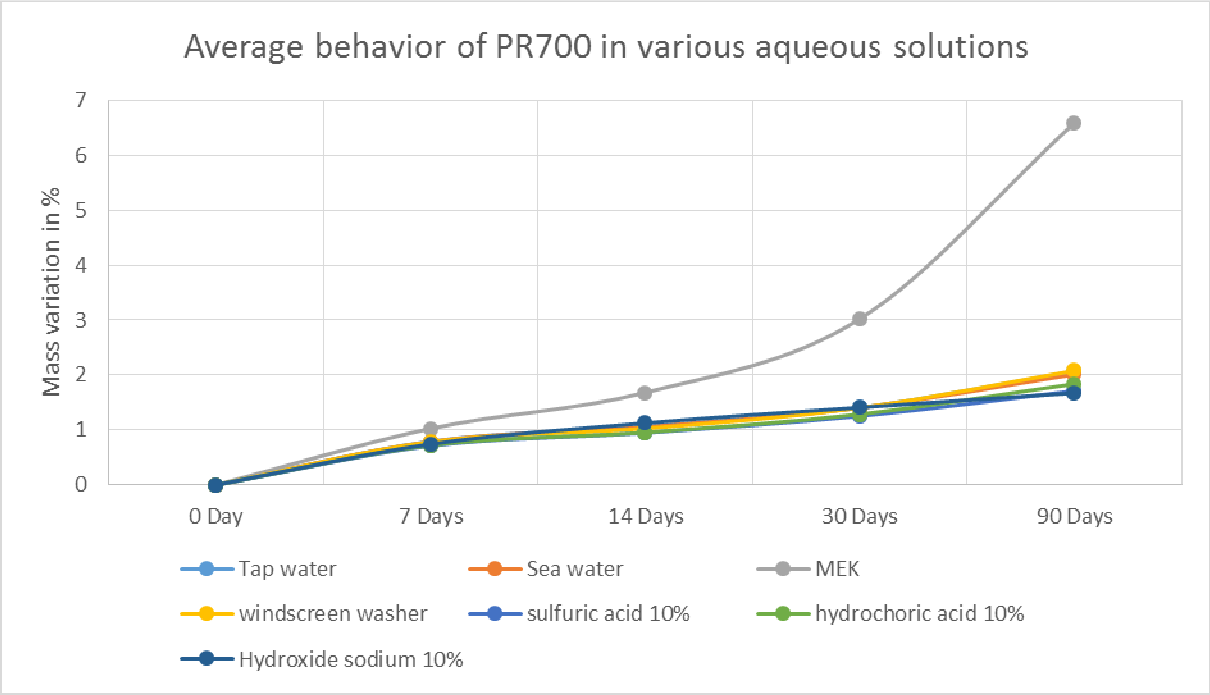
Obtained results with PR700 immersed in aqueous solutions



Analysis of PR700 results :

The behavior of this material varies according to the fluid in which it is immersed.
Motor oil and gasoline lead to a low increase of the material mass during the first 80 days, then to a steady and low decrease of the material mass.
After 184 days of immersion, the measured mass variation is under 0.1% in motor oil and under 0.2% in gasoline, which is a relatively low value, over such a long period.
The immersion in brake fluid leads at first, during the first 25 days, to a loss of mass, which can be explained by the extraction of one of the polymer's components, and then to an increase of the mass.
After 184 days of test, independently from the immersion fluid, the measured mass variation of the first series of samples is not higher, negatively or positively, than 0.25%.
Concerning the aqueous solutions, we can say after 90 days that the results are homogeneous.
The increase of the mass variation is about 2%, but we cannot observe any degradation of the material aspect. So we can say that this material can withstand diluted acids or bases.
The behavior in a MEK type solvent is acceptable if the immersion is not too long.
Although the mass variation after 14 days is important, we cannot observe a material degradation.

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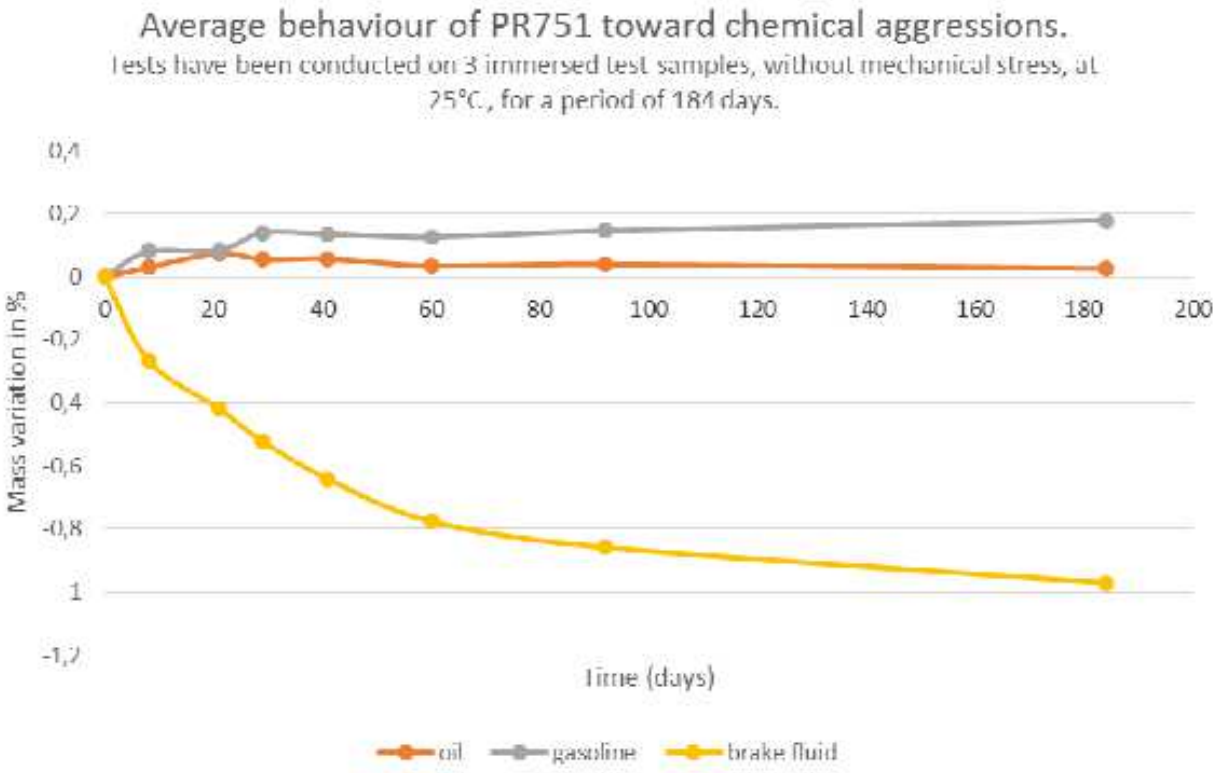
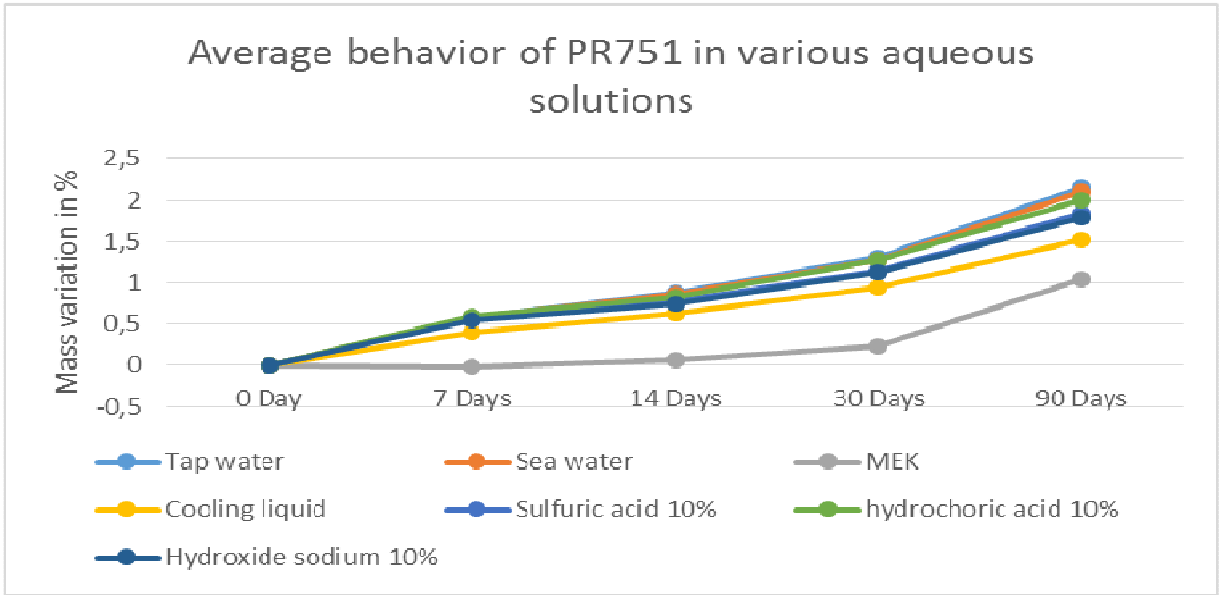
Obtained results with PR751 :



Obtained results with PR751 immersed in aqueous solutions



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Analysis of the results :

The behavior of this material varies according to the fluid in which it is immersed.
Motor oil and gasoline lead to a low but steady increase over time of the mass.
After 184 days of immersion, the measured mass variation is under 0.1% in motor oil and under 0.2% in gasoline.
Immersion in brake fluid leads to a loss of mass under 0.1% after 184 days, which can be explained by the extraction of one of the polymer's components.
Concerning the immersion in aqueous solutions, we can say after 90 days that the results are homogeneous. The increase of mass is about 2%, but we cannot see any degradation of the material's aspect. So we can say that this material can withstand diluted acids or bases.
PR751 behavior toward immersion in solvent of MEK type is better than PR700. The measured variation after 90 days is about 1%, and we cannot observe any degradation the material's aspect.

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