Hybrid materials from PVC/self-assembling systems

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Poly vinyl chloride (PVC) is an industrial polymer developed on a large scale (3rd in terms of tons produced). It is used in the making of fabrics, pipes, jacket for electric wires, and s.o.. The continuing interest towards this polymer relies on two main properties: triboelectricity, and self-extinguishable propensity (combustion stops readily in the absence of a flame). The technoloqy is now available for recycling this polymer to a large extent (see for instance http://www.vinylplus.eu/resources/publications/progress-report).

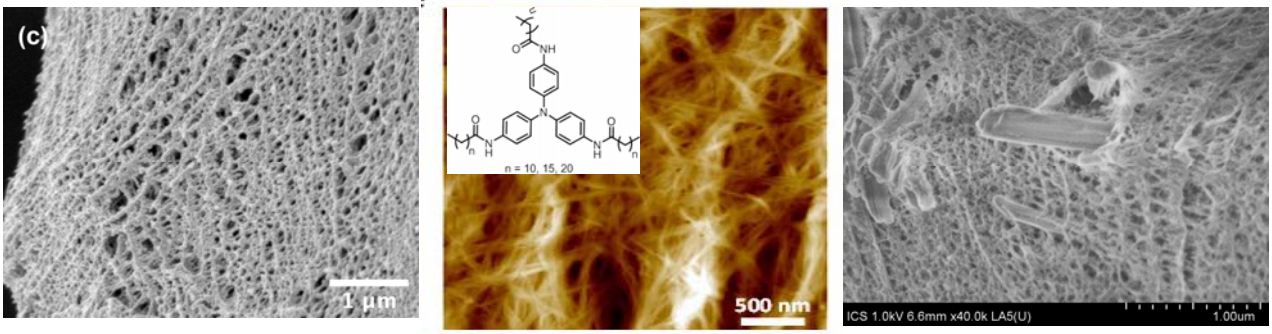

Figure 1: ***left****:* micrograph of a PVC/bromobenzene gel. ***Centre****:* micrograph of triarylamine organogel *(insert:* chemical structure of the triarylamines). ***right****:* micrograph of triarylamine/PVC hybrid. Here, one can observe triarylamine thick fibrils piercing the PVC network (unpublished).

In spite of its low crystallinity PVC produces thermoreversible gels of large mesh size in a large variety of solvents [1]. (***fig. 1 left***). It is then easy to prepare porous materials by using supercritical drying with CO_2, which allows one to keep the original gel structure.
One can impart a functional property to the PVC gels by incorporating a self-assembling system that bears the desired property. This can be easily achieved by incorporating an organogel as has been recently shown in different systems [2,3]. Organogels formed with triarylamines [4] (***fig. 1 centre***) consist also of a micrometric network [4] which can therefore be incorporated into the PVC network so as to form an intermingled gel (***fig. 1 right***). These organogels possess remarkable conducting properties close to that observed with metallic systems once properly doped [5]. One should be able through these hybrid systems to obtain a conducting polymer with a very low amount of organogel. We have recently succeeded in preparing such intermingled gels (fiig1. *right*).
The aim of this thesis will consist in preparing and characterizing these materials by means of different techniques (DSC, Rheology, X-ray and neutron scattering, tomography-X...) and to determine their conducting properties (C-AFM),... The scattering experiments will be performed on large scale facilities (for X-ray X: SOLEIL in Saclay, and ESRF in Grenoble, for neutrons: ILL in Grenoble). Tomography-X will be carried out in the lab and also at SOLEIL.

Références

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