

Supporting Information

Rheological behavior and adsorption phenomena of a polymer-particle composite based on hydrolysed polyacrylamide/functionalized poly (styrene-acrylic acid) microspheres

Seif El Islam Lebouachera^(a,b); Laurence Pesson^(a); Mohammed Abdelfetah Ghriga^(a,c); Nathalie Andreu^(a); Rachida Chemini^(b); Bruno Grassl^{*(a)}; Stéphanie Reynaud^(a)

^{a.} *Institut des Sciences Analytiques et de Physico-chimie pour l'Environnement et les Matériaux, IPREM, UMR 5254, CNRS Université de Pau et des Pays de l'Adour, 2 avenue P. Angot, Technopôle Hélioparc, 64000 Pau, France.*

^{b.} *Laboratoire des Sciences du Génie des Procédés Industriels, Faculté de Génie Mécanique et du Génie des Procédés, Université des Sciences et de la Technologie Houari Boumediene Bab-Ezzouar, 16111 Alger, Algérie*

^{c.} *Laboratoire de Génie Physique des Hydrocarbures, Faculté des Hydrocarbures et de la Chimie, Université M'Hamed Bougara de Boumerdes, Avenue de l'Indépendance, 35000-Boumerdes, Algérie*

*Corresponding authors, email: Bruno.grassl@univ-pau.fr

1. Stability of PSL in HPAM solution over time: macroscopic observation and DLS
2. ID versus PSL concentrations
3. Intrinsic viscosity versus weight-average molar mass (M_w) and radius of gyration (R_g) of HPAM model in 6 g/L of NaCl

1- Stability of PSL in HPAM solution over time: macroscopic observation and DLS

The initial HPAM aqueous solution at room temperature is transparent while the HPAM/PSL aqueous solution turns into translucent. These samples are stable, homogeneous and no visible macroscopic phase separation is observed over time at room temperature as shown in figure S2, after two week of preparation. The stability of the PSLs in the formulation has been confirmed by DLS measurements where the autocorrelation functions of the mixtures do not show any evolution over time as shown in figure S3 for HPAM/PSL formulation after 2 days and 2 months of preparation. Autocorrelation functions was obtained by using a contactless (in situ) DLS probe (Vasco flex) applied directly to the samples seen in Figure S2.

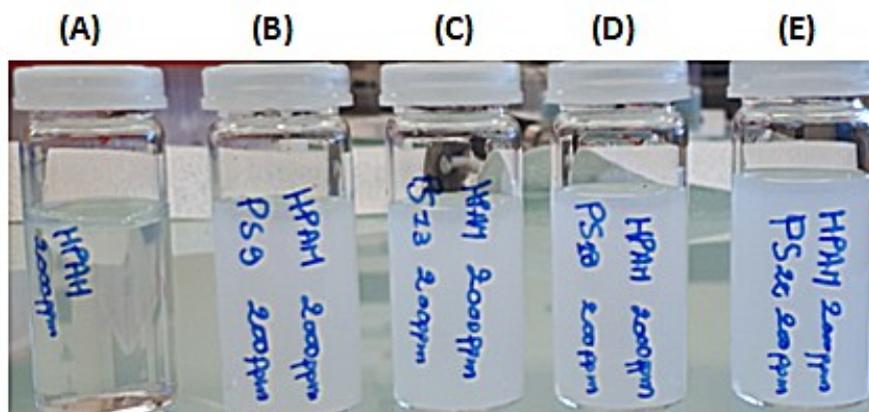


Figure S1: Appearances of (A) HPAM and (B) HPAM/PSL9, (C) HPAM/PSL13, (D) HPAM/PSL18, (E) HPAM/PSL22 after two week of preparation (T=room température ; $C_p=2000\text{ppm}$; $C_{\text{PSL}}= 200\text{ppm}$; $C_{\text{NaCl}}= 6\text{ g/L}$)

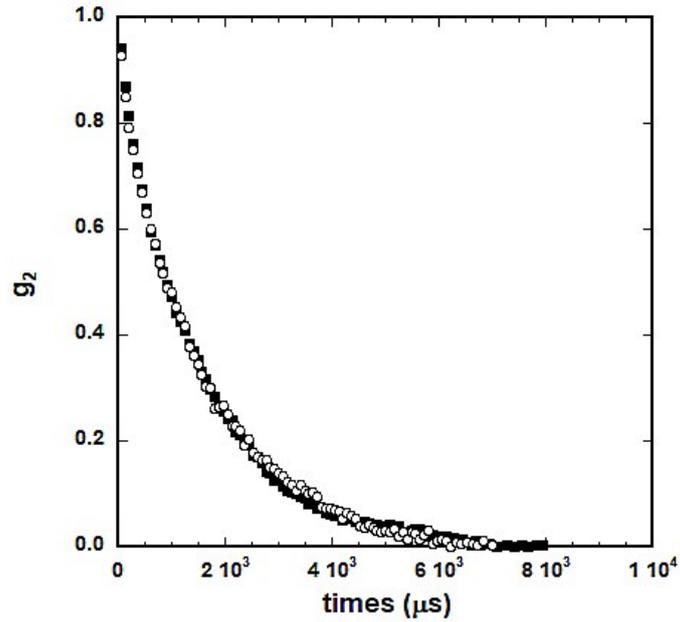


Figure S2: autocorrelation functions for HPAM/PSL22 formulation after 2 days (empty circle) and 2 months (full square) of preparation. Autocorrelation functions was obtained by using a contactless (in situ) DLS probe (Vasco flex) applied directly to the samples seen in Figure S2.

2- ID versus PSL concentrations

ID depends on particle size (d), particle concentration (C_{PSL} in mg/L), and particle size polydispersity (PDI) and decreases rapidly with PSL concentration as shown in Figure S4.

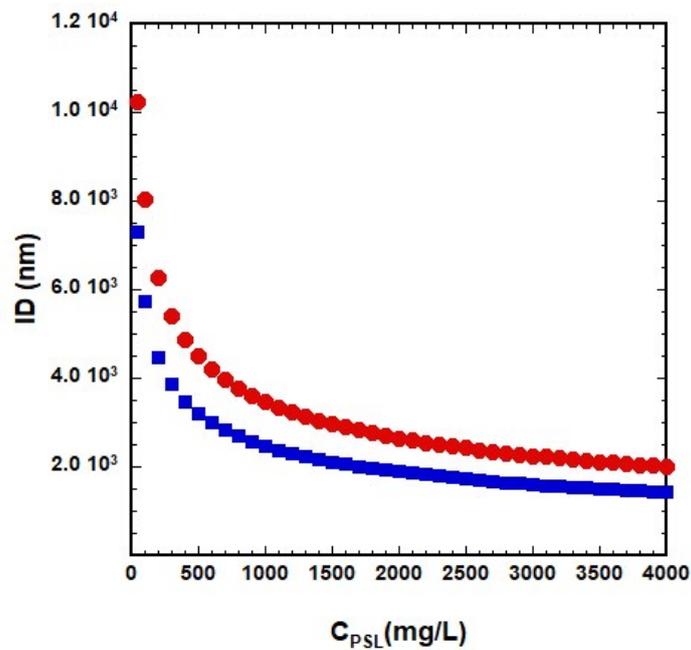


Figure S3: ID versus PSL concentrations : ● PSL22 (z-average = 490 nm), and ■ PSL13 (z-average = 350 nm).

3- Intrinsic viscosity versus weight-average molar mass (M_w) and radius of gyration (R_g) of HPAM model in 6 g/L of NaCl

The scale law $R_g = 0.022 M_w^{0.59}$ and $[\eta] = 0.022 M_w^{0.76}$ (Figure S5) was established in the laboratory on the model HPAM obtained by controlled radical polymerization. M_w and R_g were determined by SEC-RI-MALS according to a method described in the literature.¹ Intrinsic viscosities ($[\eta]$) measurements are determined according to the procedure described in the manuscript.

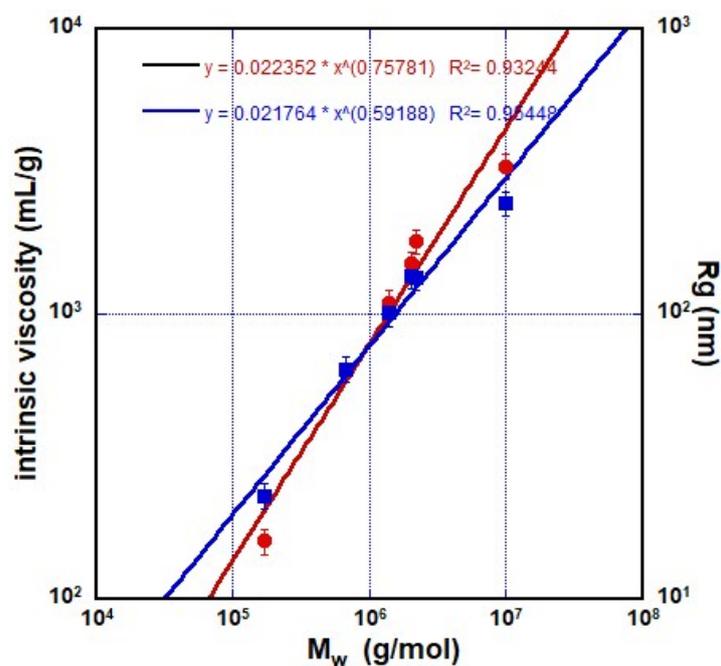


Figure S4: Scaling laws of intrinsic viscosity versus weight-average molar mass (M_w) and radius of gyration (R_g) in 6g/L of NaCl (● Intrinsic viscosity ■ R_g)

References

- 1- J. Rigolini, F. Bombléd, F. Ehrenfeld, K. El Omari, Y. Le Guer and B. Grassl, *Macromolecules*, 2011, **44**, 4462–4469.