

Accepted Manuscript

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PII: S0014-3057(18)30208-8

DOI: <https://doi.org/10.1016/j.eurpolymj.2018.07.006>

Reference: EPJ 8468

To appear in: *European Polymer Journal*

Received Date: 28 January 2018

Revised Date: 27 May 2018

Accepted Date: 4 July 2018

Please cite this article as: Shang, X., Cao, X., Ma, Y., Kumaravel, J.J., Zheng, K., Zhang, J., Zhang, R., Diphenylsiloxane-bridged Ladder-like Hydrido-polysiloxane and the Derivatization by Triphenylsiloxy Substitution, *European Polymer Journal* (2018), doi: <https://doi.org/10.1016/j.eurpolymj.2018.07.006>

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Diphenylsiloxane-bridged Ladder-like Hydrido-polysiloxane and the Derivatisation by Triphenylsiloxy Substitution

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ABSTRACT

A novel class of diphenyl-bridged ladder-like hydrido-polysiloxane (L-DPHS) was prepared through a “supramolecular template method”. Initially, a pre-coupled L-M was synthesized by dealcoholization between trimethoxysilane and diphenylsilandiol (2 : 1). Then hydrolysis and condensation reaction was carried out by using acid catalyst under mild condition. Hexamethyldisiloxane (MM) was used for final end-cap reaction. L-DPHS-1 and L-DPHS-2 with different molecular weight and end-group content were obtained, and both have condensation degrees $\geq 97\%$. The molecular weight of L-DPHSs increase with less MM added. XRD and HR-TEM characterization support the ladder-like structure with a periodic distance of ~ 1 nm. The prepared L-DPHS products were clear¹viscous liquid with refractive index of ~ 1.53 . L-DPHS-1 and L-DPHS-2 show $T_{d5\%}$ of 333 °C and 455 °C and residue of

Abbreviations

L-DPHS, diphenyl-bridged ladder-like hydrido-polysiloxane; L-DPHS-1 and L-DPHS-2, diphenyl-bridged ladder-like hydrido-polysiloxane with different molecular weight and end-group content; L-M, 1,1,5,5-tetraethoxy-3,3-diphenyltrisiloxane; MM, hexamethyldisiloxane; TP, triphenylsilanol; TP-L, a triphenylsiloxy substituted ladder-like diphenylsiloxane-bridged siloxane; LPS, ladder-like polysiloxane; L-RPSSQ, ladder-like polysilsesquioxane; L-OB-PS, ladder-like organo-bridged polysiloxane; L-PhPSSQ, ladder-like polyphenylsilsesquioxane; L-MePSSQ, ladder-like polymethylsilsesquioxane; SCP, supramolecular architecture-directed stepwise coupling polymerization; L-HPSSQ, ladder polyhydrosilsesquioxane; PSSQ, polysilsesquioxane; HTEOS, triethoxysilane; DPDO, diphenylsilandiol; Et₂NOH, N,N-Diethylhydroxylamine; Pyridine, Py; Tetrahydrofuran, THF; L-DPHS-OH, the intermediate product before end-capping; DOC, degree of condensation; $T_{d5\%}$ and $T_{d10\%}$, temperature at 5% and 10% weight loss respectively; $T_{d\max}$, temperature of maximum degradation rate.

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