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Non-porous and porous materials prepared by cross-linking of polyhydromethylsiloxane
with silazane compounds

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Abstract

In the work, polyhydromethylsiloxane (PHMS) was cross-linked with two vinylsilazanes: 1,1,3,3-tetramethyl-1,3-divinyldisilazane ($^{\text{Vi}}\text{SiNSi}^{\text{Vi}}$) or 1,3,5,7-tetravinyl-1,3,5,7-tetramethylcyclotetrasilazane ($(^{\text{Vi}}\text{SiN})_4$) in the presence of Karstedt's catalyst. When the reactions were carried out in solvent-free conditions non-porous polysiloxane-silazane networks were obtained. The processes conducted in high internal phase emulsion (HIPE) resulted in macroporous materials. Their non-porous or porous morphology was established by SEM studies. They were also analyzed by elemental analysis, swelling measurements, FTIR and ^{29}Si MAS-NMR spectroscopies and thermogravimetry coupled with mass spectrometry (TG/MS). Results showed that the non-porous networks contained high amounts of silazane moieties and were fairly hydrolytically stable. In contrast, contents of silazane units in most porous materials were low. Moreover, hydrolysis of Si-H groups of PHMS followed by condensation of the resulting Si-OH groups took place in HIPE conditions. This led to additional cross-linking of PHMS by siloxane bonds. During preparation of porous systems using $^{\text{Vi}}\text{SiNSi}^{\text{Vi}}$, hydrolysis of silazane bonds (Si-N) also occurred. All the materials studied in the work contained reactive Si-H groups and therefore exhibit a great potential for various applications. Presence of nitrogen atoms in their structure as well as porosity may be additional advantages.

Key words: polysiloxanes; silazanes; polymer networks; porous polymers

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