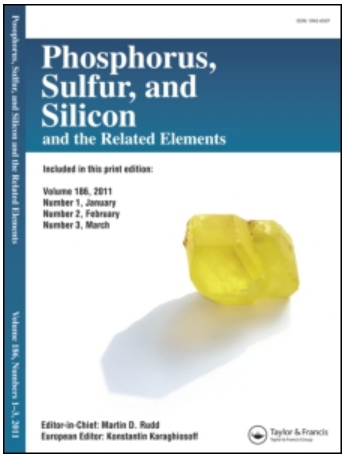

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Water-Soluble Carbosiloxane Dendrimers

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This article focuses on the preparation of water-soluble carbosiloxane dendrimers by the divergent growth method using repetitive hydrosilylation-alcoholysis cycles as well as ammonolysis and ionexchange reaction steps.

Keywords: Carbosiloxane; Dendrimers; Water-Solubility

INTRODUCTION

In recent years the number of studies on perfectly branched, highly symmetrical, tree-like macromolecules assigned dendrimers have exponentially increased.[1,2,3]

At first, great effort was concentrated on the preparation of dendritic molecules with organic skeletons while the development of heteroatom-containing dendrimers has only become of rising interest in the last few years.[4,5,6,7] Among the latter one carbosiloxane dendrimers containing Si-O-C units in the dendritic scaffold are of considerable interest.[8,9]

In this paper the construction of water-soluble dendrimers is described based on a carbosiloxane skeleton by repeated hydrosilylation-alcoholysis cycles using the divergent growth method.[10]

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RESULTS AND DISCUSSION

Due to the hydrophobic character of the Si-O-C sub-units, carbosiloxane dendrimers are insoluble in common polar organic solvents and water, respectively. Figure 1 shows an example for this kind of dendritic species prepared by the alcoholysis of a 2nd generation Cl-terminated carbosiloxane dendrimer with $HO(CH_2)_7CH_3$ in the presence of NEt_3 as a base.[11]

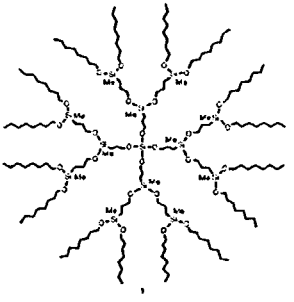


FIGURE 1 2nd generation carbosiloxane dendrimer **1**.[11]

One example of a more hydrophilic carbosiloxane dendrimer is shown in Figure 2. The 1st generation carbosiloxane polyol **2** is accessible by the substitution of terminal Cl atoms in $Si(OCH_2CH_2CH_2SiMeCl_2)_4$ by $HOCH(CH_3)COOCH_3$ followed by reduction with $LiAlH_4$.[11]

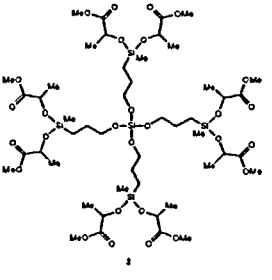
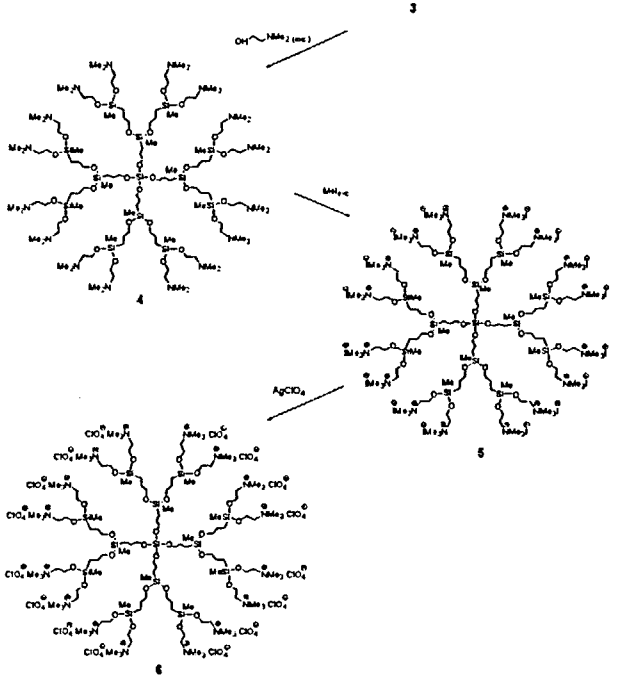


FIGURE 2 Dendritic carbosiloxane polyol **2**.[11]

Dendrimer **2** is soluable in common polar organic solvents like CH_3CN, but insoluble in water. To obtain water soluble carbosiloxane dendrimers, the terminal Cl-functionalities of *e.g.* the 2nd generation dendrimer $Si(OCH_2CH_2CH_2Si(Me)O(CH_2CH_2CH_2SiMeCl_2)_2)_4$ **(3)** were reacted with an excess of $HOCH_2CH_2NMe_2$ to produce the $Me_2NCH_2CH_2O$-funtionalised dendrimer **4** (Scheme 1). The latter molecule can be transformed into the surface modified $[O(CH_2CH_2NMe_3]^+ I^-$ quaternary ammonium derivative **5** by its reaction with CH_3I. Furthermore, the iodide counter-ions of the $NMe_3{}^+I^-$ surface bound entities can be replaced by *non*-coordinating anions such as ClO_4^- *via* treatment with $AgClO_4$ to yield molecule **6** (Scheme 1).[11,12,13]



SCHEME 1 Synthesis of the water-soluble carbosiloxane dendrimers **5** and **6**.[11,12,13]

Dendrimers **5** and **6** possess a micell-like structure which could be used for the solubilization of lipophilic compounds in aqueous solutions.[8,14]

All compounds described were fully characterised by NMR (^{1}H, $^{13}C\{^{1}H\}$, $^{29}Si\{^{1}H\}$) and IR spectroscopic studies, as well as elemental analysis.

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