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Low-melting silicon containing phthalonitrile monomers for thermosetting resins with improved processability

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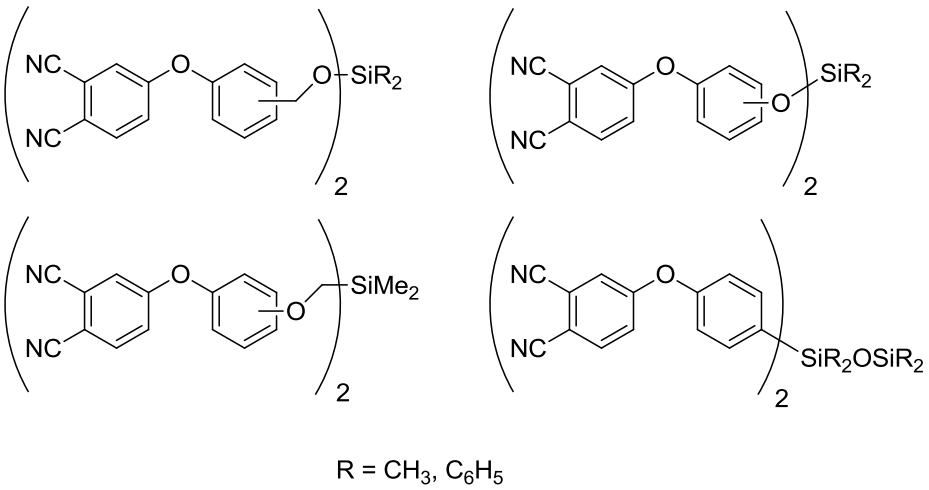
Polymer matrices developed from bis-phthalonitrile (PN) demonstrate the highest heat resistant properties among the known thermosets. Since the begining the main disadvantage of that type of resins was narrow processing window caused by high melting points of the PN monomers. Melting points of the first generation of PN monomers were 175–200 °C while fast polymerization occurred above 200°C.



R = CH_3, C_6H_5

Fig. 1. Organosilicon-linked bis-phthalonitrile monomers .

The scope of low-melting phthalonitirles bridged with various flexible organosilicon linkers was synthesized (Fig. 1). Glass transition temperatures of the amorphous PNs were in a range of (-4)–27 °C [1–4]. Thermosets obtained after curing of these monomers in the presence of aromatic diamines demonstrated thermal properties featured to PN matrices such as heat deflection temperature (>420 °C), high decomposition temperature ($T_{5\%}$ >530 °C in Ar) and a char yield (Y_c > 80%). The use of these monomers for the first time provided fabrication of composite materials by cost-effective vacuum infusion and RTM techniques.

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[3] P.B. Dzhevakov, R.F. Korotkov, B.A. Bulgakov, A. V. Babkin, A. V. Kepman, V. V. Avdeev *Mendeleev Commun. 26 **(2016)*** 527–529.