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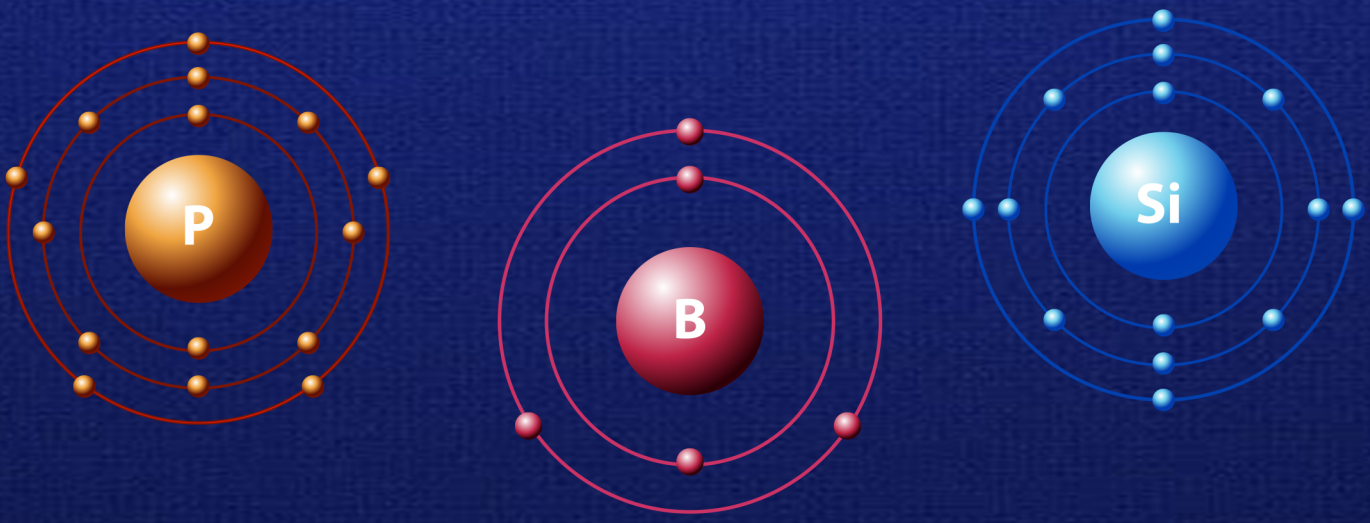
BOOK OF ABSTRACTS



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Cyclic organosilicon triperoxides as new curing agents for silicones

Monday, 2nd December - 17:31: Materials science: polymers, thin films, nanopowders, ceramics, crystals, composites etc. (Room 1) - Oral - Abstract ID: 179

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Free radical peroxide induced curing is one of the most famous methods in polymer industry to obtain 3D networks from polysiloxanes. It is relevant to search for new initiators for peroxide curing, which are close in nature to silicones. Silicon-containing peroxides satisfy these requirements. The use of these peroxides is made possible by the development of large-scale methods for their synthesis from cheap and available reagents.[1] In this work, we report that cyclic organosilicon triperoxides (Figure 1) allow curing liquid linear **PDMS**s (notably mixtures of trivinyl-terminated **PDMS** and polymethylhydrosiloxane) leading to high-quality silicone rubbers without using a roll mill and inhibitors.[2]

Cyclic organosilicon triperoxides are vinyl-selective initiators for thermal curing at 150–180 ^{O}C of vinyl-containing **PDMS** and polymethylhydrosiloxane obtaining homogeneous transparent silicone rubbers. Silicone curing was monitored by the following data: curing times, IR spectroscopy and the DSC method. The organosilicon peroxide with the Me–Si–Me moiety is a more active curing agent than other organosilicon peroxides with bulkier substituents on the silicon atom. The optimal concentrations of the peroxides are 0.09–0.22 M. The usage of polymethylhydrosiloxane in curing mixtures leads to a noticeable acceleration of curing by 2–3 times, and can be explained by the formation of cross-links for a relatively short period of time by the mechanism of radical hydrosilylation (Figure 2).[2]

Cured samples obtained with the addition of polymethylhydrosiloxane have improved mechanical properties (elongation is more than 200%, compression sets are less than 1.0%). All the silicone rubbers showed antibacterial activity against Escherichia coli. Thus, the results of this study can be useful in the creation of surfaces for possible applications in the food industry and medicine.

References

[1] Terent'ev A.O., Platonov M.M., Tursina A.I., Chernyshev V.V., Nikishin G. I., *J. Org. Chem.* **2008**, 73, 3169–3174.

[2] Deriabin K.V., Yaremenko I.A., Chislov M.V., Fleury F., Terent'ev A.O., Islamova R.M., *New J. Chem.*, **2018**, 42, 15006–15013.

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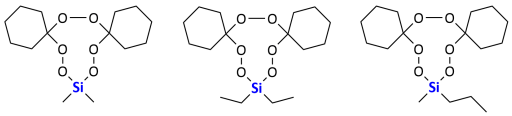

Figure 1. cyclic organosilicon triperoxides.png

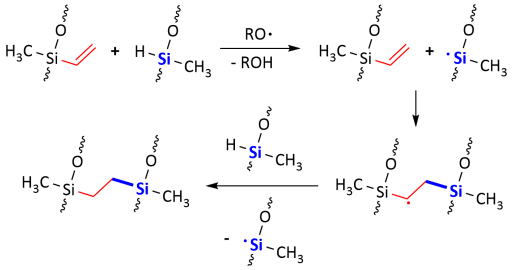

Figure 2. free radical induced curing using polymethylhydrosiloxane.png

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