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Quercetin: a natural crosslinker and chain-extender for antioxidant silicone polymers and elastomers

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PURPOSE OF THE ABSTRACT

Quercetin is one of the most abundant naturally occurring flavanols and is widely found in fruits and vegetables. It has been shown to exhibit antioxidant capabilities as a result of its polyphenolic structure. This, in combination with its natural abundance, has made it a popular dietary supplement.[1], [2]. We wished to consider its use as a natural antioxidant in silicone polymers.

Previously, we have shown that the Piers-Rubinsztajn (PR) reaction could be used to incorporate lignin3 and a simpler, naturally occurring phenol, eugenol into silicone networks[4]. We now report that the phenolic groups in quercetin could be completely or partially silylated under mild conditions (Scheme 1A). While quercetin is soluble in alcohols, the silylated analogues are much more lipophilic.

Quercetin may act as a pendant group, chain extender or crosslinker inside silicone elastomers simply by controlling the stoichiometry between SiH and ArOH groups during silylation (Scheme 1B). The Young's moduli of the elastomers could be tuned by controlling the molecular weight of the telechelic polysiloxane used; other network motifs are also readily available.

We will report on the ability of partly and completely silylated quercetin, in silicone elastomers, to act as an antioxidant; the antioxidant capabilities were probed using a colorimetric 2,2-diphenyl-1-picrylhydrazyl assay.

FIGURES

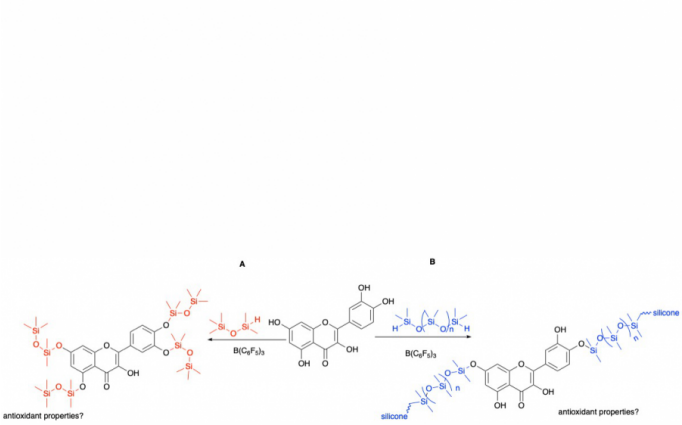

FIGURE 1

Scheme 1

A) PR reaction to produce a fully silylated Quercetin derivative.

B) use of Quercetin as a chain extender to produce Quercetin-silicone copolymers

FIGURE 2

KEYWORDS

Quercetin | Piers-Rubinsztajn | silicones | antioxidant

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