Polymeric matrix for insect repellent immobilization

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The use of conventional synthetic repellents against mosquitoes that transmit malaria, yellow fever and dengue is in decline due to public concern and regulatory demands for the use of selective and environmentally benign products. So, in recent years, research has been focused on the development of natural repellents originating from plants.[1]

Repellents are substances that act locally or at a distance. Insect repellents work by providing a vapour barrier deterring the arthropod from flying to, landing or biting human or animal skin. Among them, essential oils, complex mixtures of volatile compounds extracted from a large number of plants, have been found to have these properties against various haematophagous arthropods, some of them being the basis of commercial repellent formulations.[2]

Taking in consideration that natural product is not toxic, the aim of this work was to evaluate the possibility of use the silicone as matrix for these essential oil encapsulation to produce insect repellent devices for human and pet use. The utilized silicone was MED-4735 bicomponent silicone cross-linked by gamma radiation at 25kGy dose, in a pure state and with addition of starch. The physical-chemical and mechanical characterization was studied by gel fraction, swelling assay and tensile test, as well as *in vitro* biological characterization by cytotoxicity assay.

The Gel fraction results were 97.3±1.8 % for pure silicone and 95.8±0.2 % for silicone with starch.

The swelling curves of silicone with and without starch (Fig.1) are practically identical.

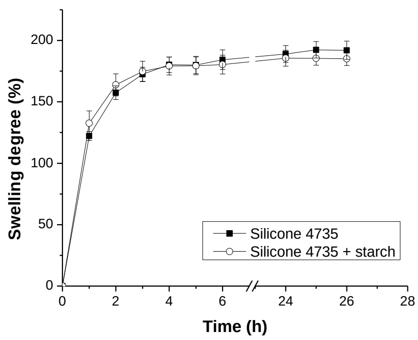

Figure 1. *Swelling curves of silicone with and without starch.*

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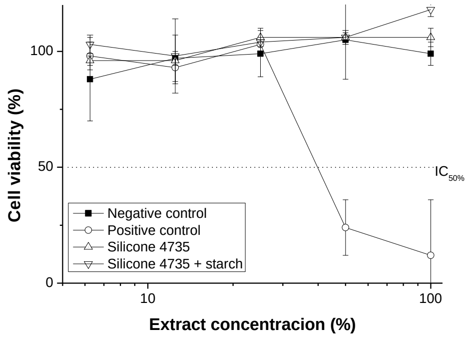

Figure 2. *Viability curves of silicone with and without starch in the cytotoxicity assay.*

In the cytotoxicity assay (Fig.2) pure silicone and silicone with starch showed the same behavior as negative control, no cytotoxic effect. Table 1 presents mechanical test results and Fig. 3 the obtained tensile profile.

Table 1. *Results of mechanical test*

		Max Strain (MPa)	Elongation (mm)	Rupture Strain (MPa)	Elongation (%)
± sd	A	6.9±0.3	147.3±3.5	6.9±0.3	589.4±13.9
	B	6.3±0.5	156.2±2.8	6.2±0.5	624.9±11.3
CV (%)	A	4.1	2.4	4.2	2.4
	B	8.3	1.8	8.3	1.8

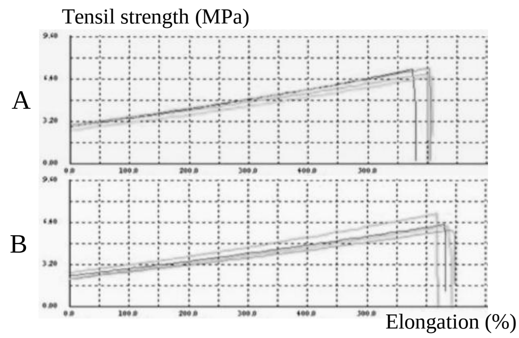

Figure 3. *Tensile profile of mechanical test. A=pure silicone and B=silicone with starch*

Pure silicone and silicone with 10% starch addition showed no significant difference in the physical-chemical, mechanical and biological tests and the results showed appropriate properties as well as no cytotoxic effect. These results indicate that silicone can be used as a matrix for production of repellent devices, after natural essential oils immobilization in starch.

References

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