

Environment-friendly animal repellent masterbatches

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The study of animal behaviour combined with the use of leading edge chemistry has led to the creation of Rodrepel and Termirepel. They are the only non-toxic and environmentally safe animal deterrent masterbatches. This shows that synthetic chemistry and sustainable development are compatible.

1. Philosophy

In European habits & traditions, we use to kill animals that bother us. Contrary to that by the Hindu philosophy it is strictly forbidden to harm any animal.

As a result, the deep study of animal behaviour combined with a high chemical level lead to the creation of Rodrepel and Termirepel.

Both products are non-toxic and environmentally safe.

2. Repellence and safety

Repellence means to drive back, ward off, or keep away. Rodrepel and Termirepel contain several bio actives that are completely non-toxic for humans as well as animals. Both products are environmentally safe: they do not enter ground water resources nor poison the environment.

3. Why animal repellents in plastics?

Animal behaviour studies have explained why animals are drawn to plastic products. The plasticisers and the aromatic odours of polymers, the bright colours and the texture of polymer products are all responsible for animals being attracted to plastic goods.

Rodents are present everywhere and can cause a lot of damage to power cables. They chew on plastic doors, sidings, benches moulded plastic parts, cables, wires, railway components, practically anything. In the wild too, several animals chew on products made of plastics such as plastic bins, containers, pipes, cables etc.

When rodents chew cables or pipes, they can cause short circuits or gas fires. Rodents often disrupt underground train services and the one or the other has already had trouble starting a car in the morning, because a rat, vole or marten had eaten through a cable.

Of all insects, termites are the most destructive.

4. Rodrepel

4.1 Efficiency

Rodrepel is efficient against rodents (mice, rat, rabbit), marten, game, deers, fish, birds, and pets. Its effect is based on the following four major principles:

- Aversion, by adding an extremely foul tasting component to the polymer.

- Discomfort, by adding a component which causes severe distress to the mucosa of the animal.
- Fear, by exploiting the olfactory response of animals to compounds which mimic the behaviour of predator urine.
- Association, by modification of animal behaviour towards products made from Rodrepel. Animals remember the above mentioned sensory stimuli.

4.2 Test report

Evaluation was done with DWC pipes (two layers) supplied by the C. Tech Corporation. The pipes were of the following physical appearance:

- One sample of 50 mm outer diameter and one with 120 mm outer diameter with gray outer and white inner surface with addition of anti-rodent repellent masterbatch.
- The above samples were exposed to two types of major rodent species predominantly found in the country, namely, *Bandicota bengalensis* and *Tatera indica*.

Observations:

Table 1 clearly shows that the weight of the samples not containing the anti-rodent additive was constantly and continuously affected, whereas the samples containing the product have shown negligible weight loss over a period of 28 days. The data shows that samples with anti-rodent additive offer advantages compared to samples without the additive.

Conclusions:

- The results on the damaging propensity revealed that the material used in the 120 OD and 50 OD DWC samples supplied by C. Tech Corporation provides a complete protection against rodent attack.
- The offered samples were found to be safe, non-hazardous and non-toxic. This is based on the use of the non-poisonous rodent repellent Rodrepel. The repellence is based on taste, olfactory (smell) and tactile (touch).

According to these studies it can be concluded that DWC pipes containing the anti-rodent additive are better protected against

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attacks by widely found rodents. We therefore advise to use DWC pipes in underground applications and in places where an attack by rodents is probable.

4.3 Test results of cables

As can be seen in **figure 1**, cables were exposed to the attack of rats for a longer

period of time. The red cable was untreated. The surface of the yellow cable was sprayed with a Rodrepel solution. The green cable was modified by the addition of Rodrepel masterbatch to the resin of the outer sheath. The figure clearly shows that the efficiency of Rodrepel increases over time. In addition, **table 2** shows that Rodrepel is more efficient than many very toxic active substances.

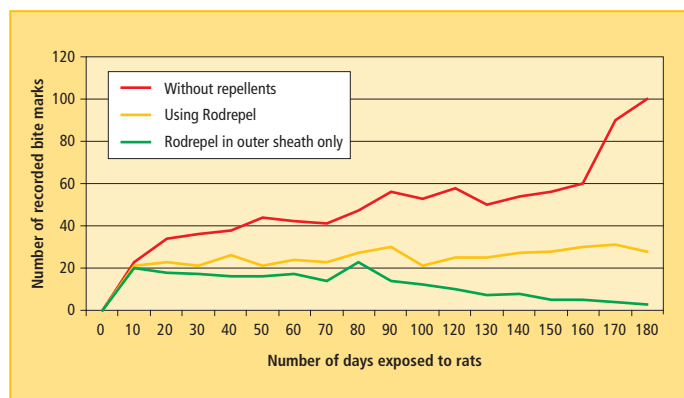


Fig. 1: Test results of cables exposed to rats

Tab. 1: Percentage weight loss

Number of days	120 OD DWC pipe without anti-rodent additive	120 OD DWC pipe with anti-rodent additive	50 OD DWC pipe without anti-rodent additive	50 OD DWC pipe with anti-rodent additive
3 days	1.039	0.410	1.010	0.280
7 days	1.730	0.410	1.560	0.440
15 days	2.012	0.450	1.710	0.560
21 days	2.660	0.471	1.890	0.660
28 days	2.980	0.480	1.910	0.690

Additive in % / Attacks in %	Bait specimen						
	A	B	C	D	E	F	G
Rodrepel (0.05) / 5.14 %	2	7	5	8	4	7	3
Lindane (0.06) / 28.28 %	26	25	24	34	21	45	23
Cobalt naphthanate (3.0) / 46.28 %	43	35	49	36	48	57	56
Untreated / 100 %	C	C	C	C	C	C	C

N = No activity noted
 C = Completely destroyed specimen
 % = Percentage of replicates attacked by rodents; Period of survey = 12 months
 Species tested against: Tatera indica (indian gerbil) & Bandicota bengalensis (bandicoot rat)

Tab. 2: Tests with different protective agents

Additive in % / Attacks in %	Bait specimen						
	A	B	C	D	E	F	G
Termirepel (0.05) / 0 %	N	N	N	N	N	N	N
Bifenthrin (0.06) / 0 %	N	N	N	N	N	N	N
Dieldrin (1.0) / 0 %	N	N	N	N	N	N	N
Untreated / 100 %	C	C	C	C	C	C	C

N = No activity noted
 C = Completely destroyed specimen
 % = Percentage of replicates attacked by insects; Period of survey = 12 months

Tab. 3: Bait storage with different protective agents

5. Termirepel

5.1 Efficiency

Termirepel is efficient against termites, ants, worms, mosquitoes, caterpillars etc. Its effect is based on the following principles:

- The anti termite masterbatch functions in a special way. It does not kill insects immediately, instead it repels and disrupts their growth and reproduction. The product incapacitates the insects rather than kills them directly.

Termirepel is structurally similar to insect hormones called "ecdysones" which control the process of metamorphosis as the insects pass from larva to pupa to adult.

The product has three modes of action on insects: it is a highly effective insect growth regulator (IGR), a feeding deterrent, and an oviposition deterrent.

5.2 Biological efficacy tests

As can be seen in **table 3**, Termirepel is as efficient as existing very toxic active substances such as pesticides.

6. Common properties

6.1 Characteristics

Rodrepel and Termirepel have been developed for all plastic applications: extrusion, injection and/or blow moulding to make various items such as nets, cables, pipes, or containers.

Both product are available as EVA- or LDPE-based masterbatch (5 % active substance content) for extrusion and calendering or as PE wax-based masterbatch (50 % active substance content) for injection and PS expansion. They can be easily mixed in during the extrusion or injection process. The products are also available as customised client specific masterbatches.

Their major properties are: a low vapour pressure, inertia and stability, electrical neutrality.

Termirepel and Rodrepel are made and patented by C-Tech Corporation, India.

6.2 Safety Parameters

- Termirepel and Rodrepel contain no lead or heavy metal toxic compounds.
- Both products contain no toxic or environmentally harmful pesticides.
- They are soil stable and do not degrade.


- They are water-insoluble.
- They contain no pyrethroids.

6.3 Handling the masterbatches

These masterbatches are safe to handle, however, because of its aversive properties, normal precautions should be taken to prevent it from adhering to the skin. When handling the masterbatch, the technician should

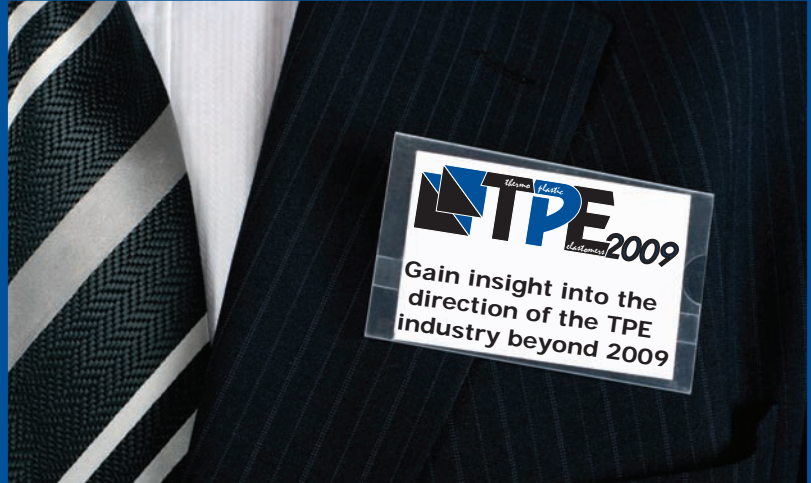
wear rubber gloves, long sleeve lab coat or similar, and eye protection. If one should come into contact with the skin, washing with large amounts of water is recommended.

The active ingredient is manufactured using non-hazardous and non-toxic materials. The intent is that if the material is ingested it will cause the human or animal to find the taste so objectionable that they are repelled.




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