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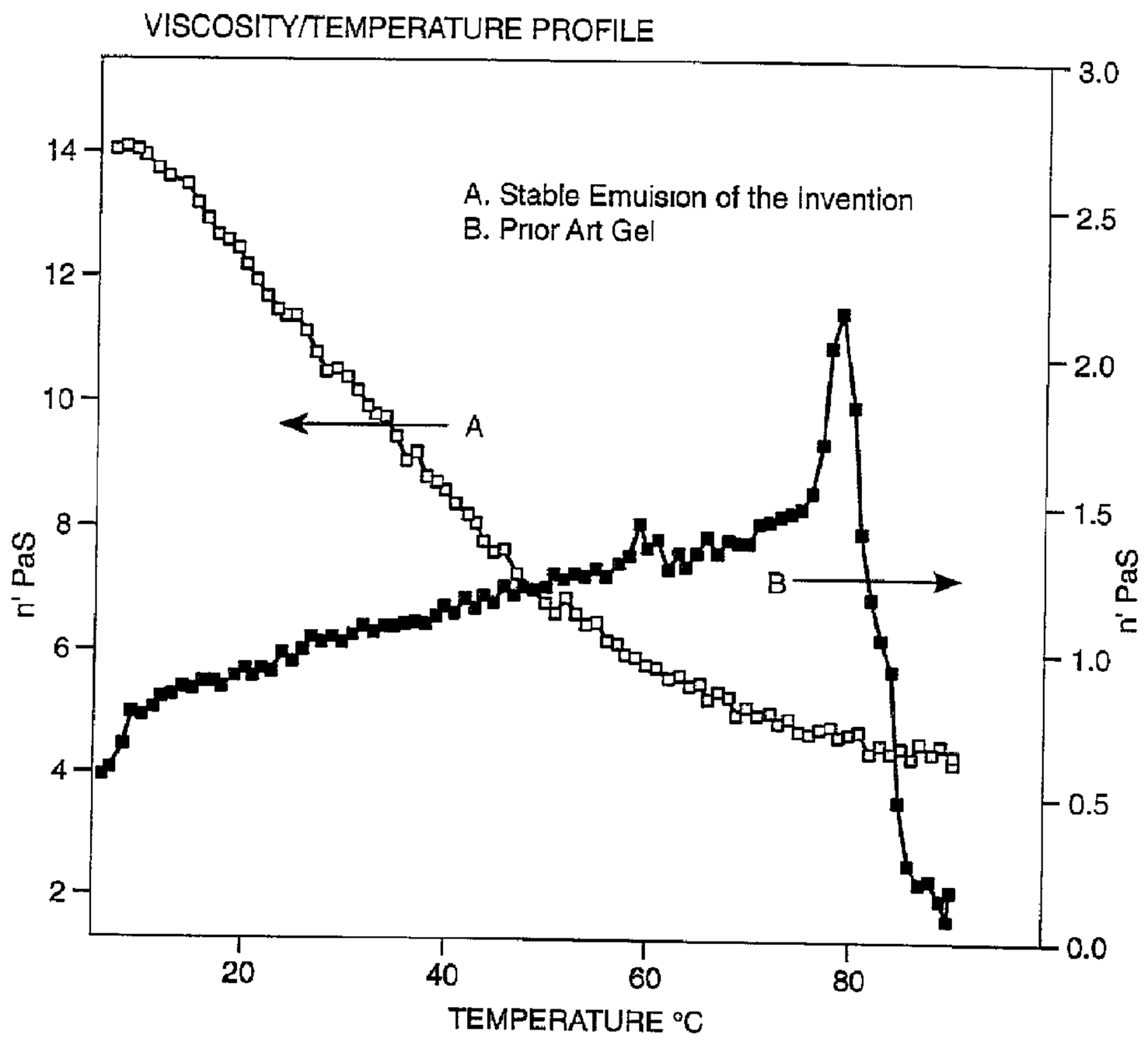

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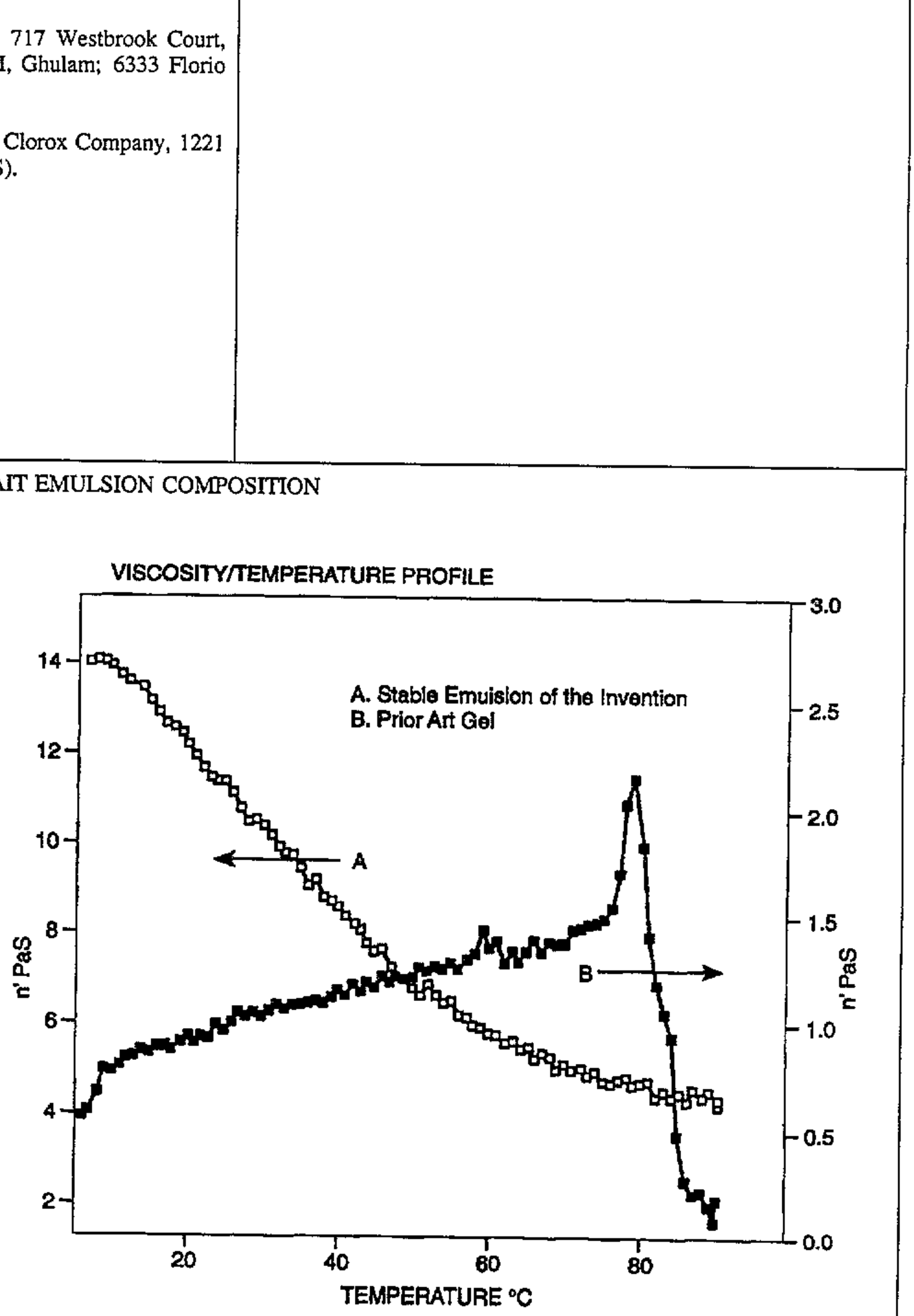

IMPROVED INSECTICIDE BAIT EMULSION COMPOSITION

Field of the Invention

The present invention relates to an improved insecticide bait emulsion composition having a novel emulsion system to impart improved delivery and application characteristic thereto.

Background of the Invention

Various methods and compositions for application of insecticide containing bait are described in the prior art. The efficiency of such compositions is improved by inclusion of various additives. Pastes or gels provide especially preferred emulsion type composition for delivery of insecticidally active ingredients together with food sources for the target insect.

The purpose of developing improved delivery systems for insecticide containing bait emulsion composition is to form a stable bait containing compositions that will contain a high percentage of water and at the same time suspend feeding nutrients and stimulants in a quantity to induce an insect to feed on the bait.

Insects, such as cockroaches, forage for food and water, they cannot detect food from large distances further than 5 to 10 inches. As a result cockroaches forage for food along baseboards and behind appliances. As the insect encounters a bait source, as a bait station, the insect will examine the bait using its mouth parts and antennae. If the bait meets the insects nutritional needs it may consume the bait. If the bait contains an insecticidally effective amount of a toxicant, the insect will be killed. Cockroaches have a tendency to learn to return to previously investigated area which previously have provided a food source.

Gel and paste compositions for the control of cockroaches are desirable means for applying food an insecticide in combination in a suitable bait/toxicant emulsion. Several previous bait gel or paste form emulsions have been disclosed. For example, U. S. Patent 4,812,309 describes an insecticidal gel compositions for the control of cockroaches. The gellant is a non-ionic surfactant block co-polymer with an average molecular weight of

about 12,500. The composition is either a liquid or a gel depending upon the temperature at which the preparation was prepared U. S. Patent 5,021,237 describes a gel insecticidal composition useful for the control of cockroaches. The insecticidal gel compositions comprise a pentadienone hydrazone as a toxicant, a fatty acid, a lower alcohol, a gellant, water, a base, and a hydrocarbon propellant. The gel bait composition comprises an oil-in-water emulsion of a toxicant in a corn syrup solution. The gellant is stearic acid. The gel is delivered by pressured spray of a bait in viscid form in situations where solid or liquid forms are not suitable.
Foam compositions have been disclosed, such as an aerosol foam composition. Although effective the foam compositions collapse to a thin film and present a form not ideal for the insect, for example the cockroach, to pick up with its mouth parts. The emulsion bait of the present invention retains its bulk and form for a longer time, thus making it easy for the cockroach to ingest.

Summary of the Invention

The present invention is drawn towards an improved stable insecticide formulated bait emulsion composition especially useful for the control of insects, in particular for the control of cockroaches, a method of preparing the composition and a method of its use. More particularly, the invention relates to an insecticidal emulsion gel or paste composition comprising an active ingredient in a stable emulsion employing cross-linked polyacrylic acid polymer, starch and modified methylcellulose.

The present invention can be applied to residential as well as industrial insect infestations for long-term control. The invention provides a means of delivering a poison insect bait in viscid form in situations where solid or liquid forms may not be suitable. Many species of insect pest are susceptible to control by the present invention. It is particularly useful and effective against cockroaches.

The emulsion composition of this invention has the following advantages over aerosol contact and residual sprays, current bait tray technology, and other gel and paste formulations.

The preparation is non-repellant. There is a higher frequency of bait placement yielding more complete treatment and control. The toxicant containing bait emulsion can be applied and placed in closer more accessible proximity to the insect harborages than

standard bait applications, such as bait trays and other gel or paste formulations. The present compositions are viscid but sufficiently fluid to be dispersed from gas-pressured cans or mechanically from tubes, syringe, or caulking gun types of application which apply the compositions as a bead of material. The toxicant application can be tailored to accommodate structural requirements where the material is to be applied. The emulsion of the present invention delivers the bait and toxicant in such a form that remains in a stable form to be readily available for ingestion by insects for a long period of time. Some other advantages include non-staining of porous surfaces, stability at a wide range of temperatures, and indefinite pot life during processing and handling. The present emulsion contains a high percentage of water (moisture) which is an advantageous insect attracting agent, especially for cockroaches.

Objectives of this Invention

It is an object of the present invention to provide insecticidal, pesticidal, or insecticidal/pesticidal compositions, and method of application of said compositions that are dispensable as a viscid flowable materials in an improved emulsion which overcome the problems and deficiencies of the prior art.

It is also an object of the present invention to provide a composition and method of preparation and method of application which is easy to prepare (formulate) and use (apply), and which is safe to the environment, but which is effective for use in controlling one or more immature and mature stages of terrestrial insects or pests, particularly, but not exclusively, insects and other arthropod pests. Of more particular effectiveness is its use in controlling cockroaches, i.e., members of the *Blatillaria*, a suborder of orthopterous insects, species of cockroaches, house inhabitors including American (*Periplaneta americana*), oriental (*Blatta orientalis*), Australian (*P. australasiae*), German (*Blatella germanica*), brownbanded [(*Supella longipalpa* (F.)], smokybrown [*P. Fuliginosa* (Serville)], and Florida woods [*Eurycotis floridana* (Walker)] cockroaches.

It is further an object of the present invention to provide a stable emulsion composition with bait and toxicant that will contain a high percentage by weight of water and at the same time suspend feeding stimulants and other additives. The emulsion can incorporate a wide variety of potentially incompatible insecticidal or pesticidal ingredients into a single, stable and homogeneous or non-homogeneous viscid flowable delivery

system to control a broad spectrum of insects or other habit-associated/related pests, by delivery thereto the active ingredients.

It is further an object of the present invention to provide a stable emulsion composition with bait and toxicant that will contain a high percentage by weight of water and at the same time suspend feeding stimulants and other additives which will satisfy the cockroach nutritional needs and thereafter be consumed as a bait and at the same time palatable enough to compete with other food sources in the environment.

Still another object of the present invention is to provide a method for simultaneously or concurrently controlling two or more natural populations of insects and habitat-associated pests such as cockroaches, with a single stable emulsion system, such as a gel or paste, delivery system.

Still another specific object of the present invention is the provision of incorporating one or more suspending agent polymers, such as homopolymers, and emulsion stabilizing agents, in order to prepare a delivery system that retains a high level of moisture, and at the same time suspends large amounts of non-homogeneous materials such as feeding stimulants and an active ingredient.

These and other objects are accomplished by the compositions and methods of the present invention and will be apparent from the following detailed description.

Description of the Invention

The use of the stable emulsions of the present invention provides simple and easy techniques for incorporation of a variety of insecticidal, pesticidal, and insecticidal/pesticidal ingredients with or without other additives, however preferably with bait materials, into stable emulsion forms, as pastes or gels, for ease of application and presentation of active agents in a suitable terrestrial habitat of the target insect or pest.

The stable emulsion pastes and gels of the present invention ingredients and amounts are set forth in Table I below.

TABLE I

EMULSION BAIT FORMULATION

Ingredient	Function	Range (% w/w)	Preferred Range (% w/w)
active ingredient	active	0.25-20.0	0.25-5.0
fatty acid (lipid phase)	diluent	1.0-20.0	1.0-5.0
carbohydrate source	food	10.0-30.0	20.0-30.0
glycerin or sorbitol	solvent	10.0-20.0	12.0-18.0
protein source	food	2.0-10.0	4.0-7.0
vegetable protein source	food	0-10	0-5.0
modified methylcellulose	gel agent	0.2-0.7	0.3-0.6
cross-linked polyacrylic acid polymer	gel agent	0.1-1.4	0.1-0.8
odor masking agent	masking agent	0.25-0.75	0.4-0.6
anti-microbial agent	preservative	0.05-1.0	0.05 -0.85
inorganic base	pH adjuster	0.35-1.0	0.35-0.70
starch	thickener	0-7.5	1.0-7.5
water	co-solvent	Q.S.	Q.S.

Description of the Drawing

Figure 1 is a plot of rheological viscosity versus temperature profiles with "A" depicting the stable emulsion of this invention and "B" depicting the prior art gel.

Description of the Preferred Embodiments

The foregoing objects of the present invention may be accomplished by forming a novel mixture or solution of proteinaceous food material and certain other ingredients, such as carbohydrates and various binding ingredients and carriers, to complete the formulation in a stable emulsion composition.

The preferred thickening or emulsifying agent is of the class carboxy polymethylene, also known as carboxy vinyl polymers; also described as vinyl polymer with active carboxyl groups. This class of vinyl polymer is a cross-linked polyacrylic acid

polymer which imparts a unique dispersion performance to the added formulation with excellent thickening efficiency and short flow rheology. This material is pH dependent and is usually activated at a pH of about 6.0 to about 9.0. When combined with a starch, a preferred gel formulation is obtained. Starch has a unique characteristic for building viscosity. When dispersed in the presence of a cross-linked polyacrylic acid polymer hydrated starch illustrates viscosity development in the solution. The result is a very satisfactory gel emulsion that sets and is resistant to flow stress even at lower viscosities and higher temperatures.

When starch or a starch derivative is used in the present invention, starch or a starch derivative of any origin may be employed, for example a starch or starch derivative from tubers, such as potato, or derived from cereals, such as corn or rice. By starch is meant any modified food starch, especially those known as cold water swelling corn starch, both waxy (i.e., derived from waxy maize) and non-waxy. The cold water modified food starch possesses many of the desired characteristics of a specialty cook up starch without heating.

The co-gelling agent is a modified alkylcellulose. As used herein, the term "alkyl cellulose" includes cellulose in which an average of between about 1.1 and about 2.5 of the available hydroxy groups on each glucoside unit have been converted to alkyl ethers. The term "alkyl" is used to include, usually lower alkyl groups having no more than about 8 carbon atoms and optionally contain hydroxyl or other functional groups. Mixtures of various alkyl cellulose compounds and/or derivatives are likewise useful. It is preferred that the alkyl group of the alkyl cellulose be primarily methyl. It is also preferred that the alkyl group be hydroxypropyl or hydroxypropyl, in combination with methyl. An especially useful alkyl cellulose is hydroxypropyl methylcellulose. All of the foregoing alkylcelluloses may be collectively referred to as modified methylcellulose.

In the preferred embodiment of the present invention a feeding stimulant composition comprising on a weight basis:

from about 2.0 to about 10% proteinaceous food material as a feeding stimuli;

from about 0% to about 10% vegetable protein as a feeding stimuli;

from about 10 to about 30% carbohydrate source; and

from about 1 to about 20% lipid.

These feeding/bait compositions have been found to be exceedingly effective for consumption by insects, such as cockroaches, for example, *Blatella germanica* and *Periplaneta americana*, which typically infest locations, both domestic and industrial, that contain sufficient food, moisture and shelter for survival.

The carbohydrate source can be selected from is fruit juice, honey, sucrose, fructose, maltose, arabinose, galactose sugar, lactose, D-lactose, D-glucosamine and the like..

Various protein sources may be used in the present formulation. Silkworm pupae is a by-product of the silk industry obtained during the isolation of silk. Compositions of the invention may readily be prepared by grinding the dry pupae by conventional methods to maximize the yield of 10-60 mesh particles, which is preferred. Animal digest is an acceptable source of animal protein coming from beef, poultry, fish and insect parts. Animal digest also includes internal organ parts obtained as by-products from slaughter house processing of such animals. These animal materials are preferably treated prior to use, as by spray-drying, freeze-drying and oven-drying.

Spray-drying methods are in the prior art and therefore no detailed exemplification need be given. However, in the interest of clarity, the following brief description of spray drying will be given. Spray-drying is unique in that it dries a finely divided droplet by direct contact with the drying medium (usually air) in an extremely short retention time, 3 to about 30 seconds. This short contact time results in minimum heat degradation of the dried product. Drying from a particle generally takes place in two stages, the constant-rate and the falling rate period. The primary drying force is the temperature difference between the surrounding air and the temperature of the particle. This technique is particularly effective in preparing poultry liver useful in the present bait compositions.

Various insect-controlling components are formulated with the attractant composition. In addition, this emulsion formulation may be formulated with an active insecticidal ingredient, preferably a pentadiene-3-one substituted amidino hydrazone insecticide as described in U.S. Pat. 4,087,525, for example,

1, 5-bis(α, α, α−trifluoro-p-tolyl)-1,4-pentadiene-3-one, 4,5,6,7-tetrahydro-1H-1,3- diazepine-2-yl hydrazone;

1,5-bis(α, α, α−trifluoro-p-tolyl)-1,4-pentadiene-3-one, 4,5,6,7-tetrahydro-1H-1,3-diazepine-2-yl hydrazone hydrochloride;

1,5-bis(p-chlorophenyl)-1,4-pentadiene-3-one, 4-phenyl-1-imidazolin-1-yl hydrazone hydriodide. The disclosure of U.S. Pat. 4,086,525 is incorporated herein by reference thereto, describing the use of these compounds as insecticides.

Other insecticides can be substituted for the substituted amidino hydrazone insecticide, particularly organophosphates, such as:

cloropyrifos — O,O-diethyl O-(3,5,6-trichloro-2-pyridinyl) phosphorothioate;

carbamates, such as proposux — 2-(1-methylethoxy)phenyl methylcarbamate;

pyrethroids, such as phenothrin — (3-phenoxyphenyl)methyl 2,2-dimethyl-3- (2-methyl-1-propenyl) cyclopropane carboxylate:

chlorinated hydrocarbons;

fluoroaliphatic sulfonamides, such as sulfluramid — N-ethyl perfluorooctane sulfonamide;

boric acid;

insect growth regulators, such as hydroprene — ethyl (E,E)-3,7,11-trimethyl- 2,4- dodecadienoate; and

microbially derived compounds, such as avermectin B_1 (a mixture of avermectins containing 80% avermectin B_{1a} (5-O-dimethylavermectin A_{1a}($R=C_2H_5$) and 20% R_{1b} (5-O-dimethyl- 25-de(1-methylpropyl)-25-(1-methylethyl) avermectin A_{1a}(RCH_3).

The lipid phase contains edible oil, a fatty acid, the active ingredient and emulsifier and the aqueous phase contains a carbohydrate, thickener, feeding stimulant and preservative. Other long chain fatty acids and various lipids would be acceptable substitutes or replacements for the fatty acid and lipid components identified herein.

Therefore, the present invention includes a method for controlling cockroaches comprising applying in the vicinity of their habitat or infested area an insecticidal bait composition comprising an insecticidally effective amount of a substituted amidino hydrazone insecticide or fatty acid salt thereof and the stable emulsion of bait feeding composition containing feed stimulants according to the present invention. Additional edible carriers and additives such as fish meal, sugars, flour and the like may be added and the mixture blended until homogeneous.

Antimicrobial and/or antioxidant agents also may be included. Optionally, from about 0.5% to about 1.0% of an antimicrobial agent such as sorbic acid/ potassium sulfate,

Dowcil™ 200 (cis isomer of 2-(3-chloroallyl)3,5,7-triaza-l-azonia-l-adamantine chloride), esters of p-hydroxybenzoic acid such as propyl paraben/methyl paraben (propyl p-hydroxy benzoate/methyl p-hydroxybenzoate), Captan (N-(trichloromethylthio)-4-cyclohexane-1,3-di-carboximide), sodium silicate, sodium dehydroacetate and sodium benzoate, bromo-nitro propane diods such as 2-bromopropane 1,3-diol, 3-iodo-2-propylbutyl carbamate; and benzothiazolin-3-one may be added to inhibit microorganism growth may be incorporated during formation of the emulsion composition of this invention.

Testing

Bioefficacy Test

To evaluate the continued efficacy of the active ingredient, hydramethylnon [tetrahydro-5,5-dimethyl-2(1H)-pyrimidinone[3-[4-(trifluoromethyl) phenyl]1-[2-[4-(trifluoromethyl) phenyl]ethenyl]-2-propenylidene]hydrazone,1,5-bis (α,α,α-trifluoro-*p*-tolyl)-1,4-pentadiene-3-one (1,4,5,6-tetrahydro-5,5-dimethyl-2-pyrimidinyl)hydrazone in the stable emulsion of this invention, the insecticide bait product was tested in the following bioassay test for German cockroach as the test species.

Three arenas (3 replicates for the treatment) were assembled each containing 20 German cockroaches of assorted ages and sexes. Each arena was a box cover (16 in. x 10. in. x 6 in.) or the equivalent with a perforated cover to prevent escape of the test insects. Each arena was prepared with harborage and a 4 oz. water bottle with a wick as a water source for the insects in the arena. Harborage consisted of a cardboard mailer box (4.5 in. x 2.75 in. x 2.5 in.) with a triangle entrance cut on one side of the side panel.

After the roaches acclimated for 48 hours samples of the test bait was introduced into each arena. Standard conditions consisted of temperature at 80° F and 50 % relative humidity with a light/dark cycle of 12 hours each.

Each arena was arranged with harborage and water source placed on the farthest end of the arena from the bait. Alternate food (3-4 dog food nuggets or the equivalent) was placed in the center of the arena. The treatments consisted of the stable emulsion product of this invention according to TABLE II, except for 5.9 % (wt.) poultry liver used instead of 5.00 % (wt.).

Cumulative mortality count for each arena was recorded at 3, 4, 5, and 6 days after the product was placed in each arena. The results are reported in TABLE A. The LT_{50} is 3 days and the LT_{90} is about 4.5 days.

TABLE A					
Formulation	**Bioefficacy of Arena #**	**Time**			
		Day 3	**Day 4**	**Day 5**	**Day 6**
Stable emulsion of this invention	C_1	12/20	16/20	20/20	20/20
	C_2	13/20	18/20	20/20	20/20
	C_3	15/20	18/10	18/20	19/20

Field Evaluation

A field evaluation was conducted to determine the efficacy of the stable emulsion composition of the present invention. Representative target insects were the natural cockroach population in residential apartments naturally infested with cockroaches, that is, testing was done under natural field conditions in apartments.

The active ingredient insecticide used was hydramethylnon. The following table represents the stable emulsion gel bait formulation used in this field evaluation.

TABLE II		
STABLE EMULSION BAIT FORMULATION		
Ingredient	**Function**	**Amount (w/w %)**
hydramethylnon	active	2.15
oleic acid	diluent	2.00
corn syrup (high fructose 55)	food	30.00
glycerin	solvent	10.00
poultry liver	food	5.00
chicken broth (100% solids)	food	0.66
hydroxypropyl methylcellulose	gel agent	0.40
acrylic acid homopolymer (9003-01-4)	gel agent	0.70
anti-odor mask WL-20,052*	masking agent	0.50
1,2-Benzothiazolin-3-one**	preservative	0.50
propyl paraben***	preservative	0.20
methyl paraben***	preservative	0.15
sodium hydroxide	pH adjuster	0.70
starch	thickener	7.50
water	co-solvent	Q.S.

* Florasynth Co., Teterboro, NJ 06708
** Zeneca Biocides, Wilmington, DE
***Parabens - esters of p-hydroxybenzoic acid; Aldrich Chemical Co., Milwaukee, WI

The procedure for the field evaluation included pre-trapping the apartments with sticky traps for 48 hours prior to the application of the emulsion gel formulation in the apartment. This was done to establish a control or population count prior to placement of the emulsion baits. Emulsion bait was placed in kitchens of the apartments in the following areas: under the sink in rear corner, under the stove on both sides; under refrigerator on both sides; upper cabinets top shelf, in the rear; lower cabinets, in rear corners; pantry; and cabinet above refrigerator. Approximately 20 grams of the emulsion gel formulation was distributed among the above locations. This delivered approximately the same weight of bait as 12 bait stations. A total of ten (10) apartments, with ten replicates for each for the first week, and ten apartments for ten replicates for the second week was used. The stable gel formulation was applied using a syringe of 20 grams per apartment.

Results of the field evaluation and bioassays concerning the efficacy of the stable emulsion of this invention yields the following results:

After four weeks, there was a mean reduction of cockroach population of 51.72%. A second test using 1.0% active ingredient according to the above formulation produced a result of 79.1% cockroach population decrease.

Rheological Comparison

Rheological measurements were performed using a Bohlin Oscillatory Viscometer (VOR Model) employing a 30 mm parallel plate measuring system (P 30) with 1 mm gap operated at either 0.2, 1 or 10 Hertz at an amplitude of 3% under controlled temperatures ranging from 6 to 90°C.

The viscosity versus temperature profiles of two gel formulations are presented in Figure 1, with arrows indicating the proper scale (in Pascal seconds) corresponding to the two data curves. The gel composition of the current embodiment is designated as "stable emulsion" corresponding to curve "A". The comparison gel disclosed by previous patent U.S. 4,812,309 is designated "Prior Art" gel corresponding to curve "B". Comparison of the temperature profiles confirms a high degree of dissimilarity in the properties of the two gels. While the preferred "stable emulsion" of this invention losses some viscosity with increasing temperature, the prior art gel slightly increases in viscosity until it exhibits a very sharp melting point transition at roughly 75-80°C, after which its viscosity drops precipitously to a very low value. No such melting point transition and correspondingly unfavorable drop in viscosity is observed at any temperature for the preferred "stable emulsion of this invention.

Other physical parameters of the two gels are presented in Table III at three temperatures typically encountered under usage conditions. The phase angle, Ø, which rises from 0° to 90° and which corresponds to the relative extent of solid and liquid properties, respectively, is seen to increase with temperature for the prior art gel, indicating that it becomes more liquid-like with increasing temperature. In contrast, the phase angle measured for the stable emulsion of this invention decreases with increasing temperature, indicating the preferred tendency of this formulation to become more solid-like at higher temperatures. Further, comparison of viscosity values shows the preferred stable emulsion maintains a higher nominal viscosity compared to the prior art gel over typical usage temperatures.

TABLE III							
PHYSICAL PROPERTY	**UNIT**	**Prior Art Gel**			**Stable Emulsion**		
Temperature	°F	77	100	120	77	100	120
phase angle, Ø	degrees	2.8	3.5	3.1	14.9	14.3	12.9
viscosity	Pascal's	1.25	1.4	1.5	11.5	8.8	7
flow point	lbs/in^2	4.4	5.9	3.9	7.9	5.8	4.8

Flowability

Flowability measurements were performed using an Instron Automated Materials Testing System (Series IX 6.02) using product-filled syringes at controlled temperatures ranging from 70 to 120°F.

TABLE IV			
Gel Type	**Temp.**		
	Ambient	100°F	120°F
Prior Art Gel	6.4 lbs	8.0 lbs	5.5 lbs
Stable Emulsion	10.8 lbs	7.9 lbs	8.6 lbs
Flowability comparison: Displacement of .5" product under Instron Testing (Compression Test) @2"/m in Xhead speed. Cell Load maximum 20 lbs. Product displaced from the same size orifice.			

Comparison of flowability values show that the stable emulsion of this invention exhibits the more preferential behavior of maintaining a higher flow point throughout its temperature range, most notably at 120°F, compared to the prior art gel, which flows at a decreased applied pressure at 120°F, and which is thus more likely to sag and flow unfavorably from its application point.

Sag Test

The stable emulsion of the present invention was compared side-by-side with gel formulations labeled Prior Art I and Prior Art II, which utilized non-ionic surfactant block copolymers according to U.S. Pat. 4,821,309. A comparable amount of each gel type was applied to a substantially vertical surface at room temperature. The surfaces were then

exposed to increasing temperatures of 100 to 120°F. When the higher temperature was achieved, all the test samples were maintained at this temperature and successive readings taken at 3 hours, 6 hours and 48 hours. These results are reported in Table V.

TABLE V

Gels Sagging Test

Gel Type	Room Temp.	100°F	120°F (3 hrs)	120°F (6 hrs)	120°F (48 hrs)
Prior Art I*	0.0	0.0	1.5"	5.5"	>6"
Prior Art II*	0.0	0.0	1.2"	5.2"	>6"
Stable Emulsion This Invention	0.0	0. 0	0.0	0.0	0.0

* Prior Art I and II gel formulations utilize a non-ionic surfactant block co-polymer according to U.S. Pat. 4,812,309.

Consistency - Cohesiveness ("Consistency-Penetration Method")

This penetration test provides an arbitrary measure of the firmness of plasticized substances and the like by measuring the distance of a given weight of defined shape will penetrate the substance in a certain period of time. The firmness of the substance is related to the composition and character of the substance, to the temperature of the sample at the time of measurement and to the previous history of the sample. This test performed with sample at room temperature, about 70°F ±3; 100°F and 120°F. This method is applicable to plastic fats and solid emulsions such as shortenings, margarine, butter, paint, cosmetic creams, gels and similar products.

TABLE VI						
	Ambient		100°F		120°F	
Test No.	Stable Emulsion	Prior Art	Stable Emulsion	Prior Art	Stable Emulsion	Prior Art
1st test	70 mm	132 mm	216 mm	275 mm	280 mm	325 mm
2nd test	73 mm	155 mm	210 mm	275 mm	270 mm	325 mm
3rd test	68 mm	120 mm	220 mm	273 mm	270 mm	325 mm
Average	70 mm	135 mm	215 mm	274 mm	273 mm	325 mm

This property lends the stable emulsion of this invention for use in bait trays as a high moisture-containing bait toxicant composition. The substance maintains a satisfactory constant consistency over a wide temperature range.

Although the invention has been described in terms of specific embodiments and applications, persons skilled in the art to which this invention pertains can, in light of these teachings and disclosure, generate additional embodiments without exceeding the scope or departing from the spirit of the claims invention. Accordingly, it is to be understood that the drawings and description in this disclosure are presented to facilitate comprehension of the invention, and should not be construed to limit the scope thereof.

CLAIMS

1. A stable insecticide bait emulsion composition comprising

(a) a suitable insect bait.

(b) an insecticidally effective amount of an insecticidal agent, said agent being present in an amount effective to control a target population of insects when applied to a target habitat:

(c) emulsion forming additives: and

(d) other formulating additives wherein said composition is an admixture formed by mixing said insect bait and said insecticidal agent with the emulsion forming additives and other formulating additives,

wherein the emulsion forming additives are one or more members selected from the group consisting of cross-linked polyacrylic acid polymers and modified alkylcellulose wherein alkyl is lower alkyl having no more than about 8 carbon atoms.

2. The stable insecticide bait emulsion composition according to claim 1 wherein the emulsion forming additives comprise one or more suspending agent polymers, and one or more emulsion stabilizing agents and a thickener.

3. The stable insecticide bait emulsion composition according to claim 2 wherein the emulsion forming additives are carboxy polymethylene and hydroxypropyl methylcellulose.

4. The stable insecticide bait emulsion composition according to Claim 2 in which the suitable insect bait contains one or more proteinaceous food material and one or more carbohydrate source.

5. The stable insecticide bait emulsion composition according to Claim 2 in which the insecticidal agent is a substituted amidino hydrazone or fatty acid salt thereof.

6. The stable insecticide bait emulsion composition according to Claim 3 in which the insecticidal agent is a substituted amidino hydroazone is a pentadiene-3-one substituted amidino hydrazone.

7. The stable insecticide bait emulsion composition according to Claim 2 in which the insecticidal agent is a substituted amidino hydrazone is 1,5-bis(α, α, α–trifluoro-p-tolyl)- 1,4-pentadiene-3-one, 4,5,6,7-tetrahydro-1H-1,3-diazepine-2-yl hydrazone.

8. A toxic insect bait for controlling a target insect comprising a high moisture stable emulsion composition comprising a suitable insect bait attractant to attract said insect to the toxic insect bait and an insecticide which is toxic to said target insect, and emulsion forming ingredients in an amount effective to yield a stable emulsion of the insect bait attractant and toxic insecticide.

wherein said emulsion forming ingredients are one or more members selected from the group consisting of cross-linked polyacrylic acid polymers and modified alkylcellulose wherein alkyl is lower alkyl having no more than about 8 carbon atoms.

9. A method of controlling a target insect comprising applying to the locus or habitat of said insect a formulated stable emulsion containing an insecticidally effective amount of an insecticide comprising a suitable insect bait attractant to attract said insect to the toxic insect bait; an insecticide which is toxic to said target insect, and emulsion forming ingredients in an amount effective to yield a stable emulsion of the insect bait attractant and toxic insecticide.

wherein said emulsion forming ingredients are one or more members selected from the group consisting of cross-linked polyacrylic acid polymers and modified alkylcellulose wherein alkyl is lower alkyl having no more than about 8 carbon atoms.

10. A stable insecticide bait emulsion composition comprising

a) a suitable insect bait comprising on a percent weight basis from about 2.0 to about 10% proteinaceous food material as a feeding stimuli;

from about 0% to about 10% vegetable protein as a feeding stimuli;

from about 10 to about 30% carbohydrate source; and

from about 1 to about 20% lipid;

b) an insecticidally effective amount of an insecticidal agent selected from the group consisting of a pentadiene-3-one substituted amidino hydrazone, cloropyrifos, carbamates, pyrethroids, chlorinated hydrocarbons, fluoroaliphatic sulfonamides, boric acid, insect growth regulators, and microbially derived compounds comprising avermectin B_1 (a mixture of avermectins containing 80% avermectin B_{1a} (5-O-dimethylavermectin A_{1a}(R=C_2H_5) and 20% R_{1b} (5-O-dimethyl- 25-de(1-methyl-propyl)-25-(1-methylethyl) avermectin A_{1a}(RCH_3) said insecticidal agent being present in an amount effective to control a target population of insects when applied to a target habitat;

c) emulsion gel forming additives comprising one or more members selected from the group consisting of cross-linked polyacrylic acid polymers and modified alkylcellulose wherein alkyl is lower alkyl having no more than about 8 carbon atoms; and

d) other formulating additives consisting of solvents, thickeners, odor masking agents, preservatives, and pH adjusters, wherein said composition is an admixture formed by mixing said insect bait and said insecticidal agent with the emulsion forming additives and other formulating additives.

11. The stable insecticide bait emulsion composition according to Claim 10 wherein the emulsion forming additives are carboxy polymethylene and hydroxypropyl methylcellulose.

12. The stable insecticide bait emulsion composition according to Claim 10 in which the insecticidal agent is a substituted amidino hydrazone is a pentadiene-e-one substituted amidino hydrazone.

13. The stable insecticide bait emulsion composition according to Claim 12 in which the insecticidal agent is a substituted amidino hydrazone is 1,5-bis(α, α, α–trifluoro--p-tolyl)-1,4-pentadiene-3-one, 4,5,6,7-tetrahydro-1H-1,3-diazepine-2-yl hydrazone.

14. A method of controlling a target insect comprising applying to the locus or habitat of said insect a formulated stable emulsion containing

a) a suitable insect bait comprising on a percent weight basis from about 2.0 to about 10% proteinaceous food material as a feeding stimuli;

from about 0% to about 10% vegetable protein as a feeding stimuli;

from about 10 to about 30% carbohydrate source; and

from about 1 to about 20% lipid;

b) an insecticidally effective amount of an insecticidal agent selected from the group consisting of a pentadiene-3-one substituted amidino hydrazone, cloropyrifos, carbamates, pyrethroids, chlorinated hydrocarbons, fluoroaliphatic sulfonamides, boric acid, insect growth regulators, and microbially derived compounds comprising avermectin B_1 (a mixture of avermectins containing 80% avermectin B_{1a} (5-O-dimethylavermectin A_{1a}($R=C_2H_5$) and 20% R_{1b} (5-O-dimethyl- 25-de(1-methyl-propyl)-25-(1-methylethyl) avermectin A_{1a}(RCH_3) said insecticidal agent being present in an amount effective to control a target population of insects when applied to a target habitat;

c) emulsion gel forming additives comprising one or more members selected from the group consisting of cross-linked polyacrylic acid polymers and modified alkylcellulose wherein alkyl is lower alkyl having no more than about 8 carbon atoms; and

d) other formulating additives consisting of solvents, thickeners, odor masking agents, preservatives, and pH adjusters, wherein said composition is an admixture formed by mixing said insect bait and said insecticidal agent with the emulsion forming additives and other formulating additives.

15. The stable insecticide bait emulsion composition according to claim 1, wherein said alkyl contains hydroxyl groups.

16. The stable insecticides bait emulsion composition according to claim 3, wherein said emulsion forming additives further comprise starch.

17. The stable insecticide bait emulsion composition of any one of claims 10 to 13, wherein said alkyl contains hydroxyl groups.

18. The stable insecticide bait emulsion composition of claim 11, wherein said emulsion forming additives further comprise starch.

19. The method of controlling a target insect according to claim 14, wherein said alkyl contains hydroxyl groups.

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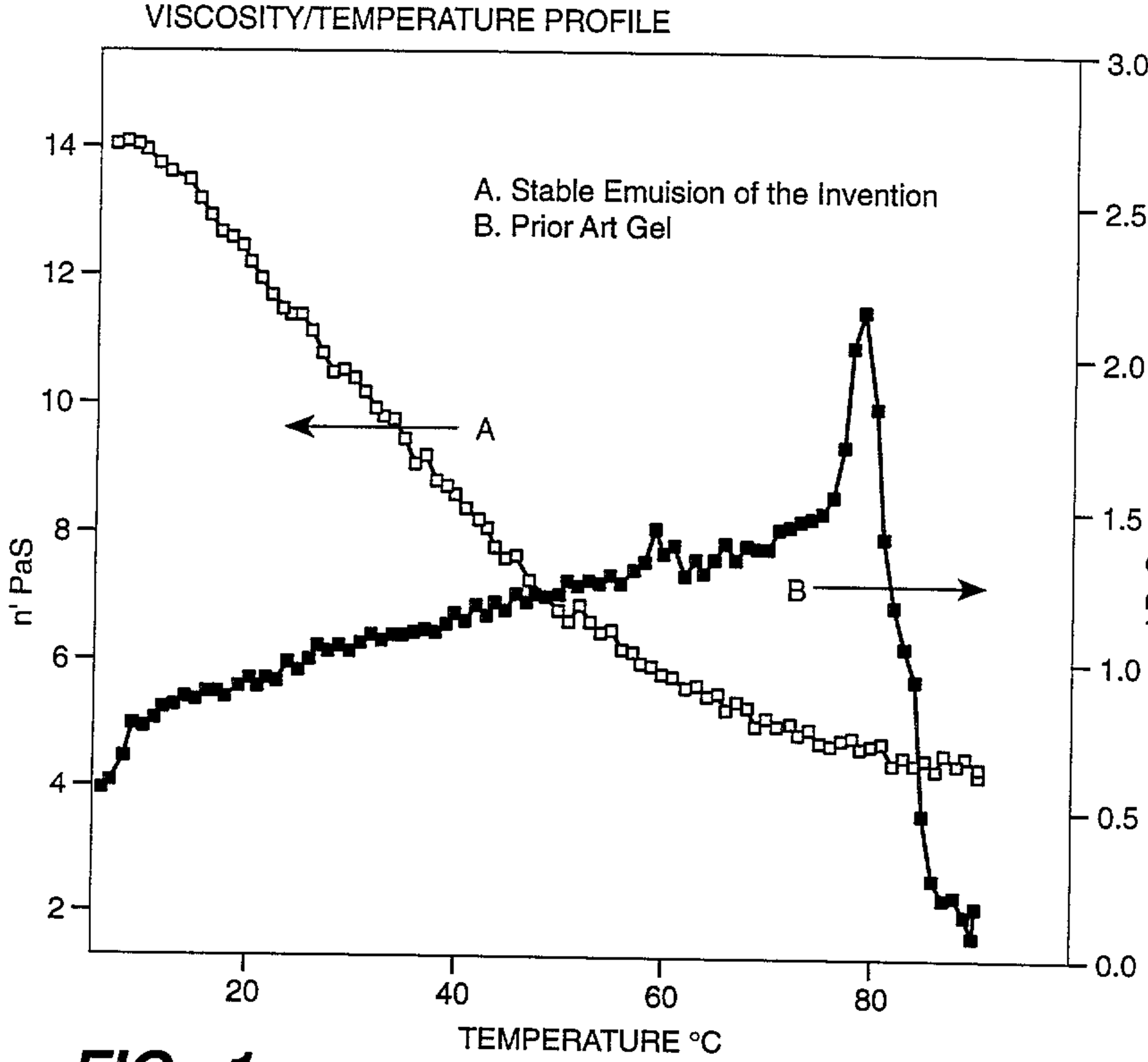

FIG._1

VISCOSITY/TEMPERATURE PROFILE

A. Stable Emuision of the Invention
B. Prior Art Gel

A

B

n' PaS

n' PaS

TEMPERATURE °C

14
12
10
8
6
4
2

3.0
2.5
2.0
1.5
1.0
0.5
0.0

20
40
60
80