Wood Preservation 2009

Rotorua (NZ) 15-16\textsuperscript{th} April
Brisbane (Aust.) 21-22\textsuperscript{nd} April

Successful Treatment of Engineered Wood Products – the Opportunity for Micro-encapsulation
Wood Preservation 2009

Agenda

Zelam Ltd. overview
Micro encapsulation
PTGT
Opportunities for micro-encapsulation

Zelam Ltd.
Zelam Ltd.

Privately owned company based in New Plymouth, New Zealand. Trading since 1988, then under Taranaki NuChem Ltd., now as Zelam Ltd.

Operates in three key market segments:
- Timber
- Agriculture
- Industrial

Exports to many countries throughout the world.

Facilities:
- Administration, research, manufacturing and warehousing facilities in New Zealand (multiple sites).
- Administration & research facilities in Australia.
- Research facilities in the UK.
- Zelam places a very strong emphasis on research and development, with a focus on products for the future.
Zelam Ltd. - timber research facilities

Workshop facility and equipment that offers;
Vacuum/pressure treatment plants, 25L & 800L.
Full size veneer sheet vacuum treating plant.
MDF blender & strand/chip tumbler.
Computer controlled hot press (& cold press).
Spray application system.
Timber testing machine (structural properties).
Full microbiology laboratory for fungal decay work (rot jar tests etc.).

Micro Encapsulation - ENCAPS

What is a microcapsule?
A capsule is defined as a small container in most dictionaries.

Micro refers to the scale of this capsule, in that we measure the size of the capsules in micrometers (millionth of a meter or thousandth of a millimeter).

Therefore a microscopically small container.
Where has the technology come from?
Initial global work began on agricultural chemicals two decades ago.

Capsule formulations (CS) becoming increasingly popular on the global market.

Formulation technology used in many markets including; agriculture, pharmaceutical, cosmetics, paints and inks.

Zelam has acquired the services of a world specialist in micro encapsulation.

Zelam has one of very few continuous plants globally and the only one in the sthn. hemisphere.
Micro Capsules must not be confused with Nanoparticles.

Nanoparticles are particles finely ground down to nanometres in size – typically 1 to 100 nanometres in diameter (or 0.001 to 0.1 microns).

Micro capsules are capsules formed around each particle of ‘active’. Typical size is 0.5 to 20 microns in diameter (or 500 to 20,000 nanometres).

How are they made?

We have a liquid organic phase containing the dissolved active as well as one of the plastic forming ingredients.

We emulsify this into some water (that contains some components to maintain the emulsion).

Then we add a curing agent that reacts at the surface of each tiny sphere forming a plastic film over the outside of each sphere – creating the capsule.
**Micro Encapsulation - ENCAPS**

**What are the benefits of microcapsules?**

There are many benefits to be had but those usually identified are;

- Protection of the contents of the capsules from the environment and vice versa.
- Improved stability of otherwise unstable actives.
- Controlled release of the active material.
- Mixing of otherwise antagonistic active partners.

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**Pollen Tube Growth Test**

**Tobacco pollen tube growth test**

- Laboratory assay used to indicate relative dermal and eye toxicity.
- Widely used by global companies.
- Recognised by the *European Centre for Validation of Alternative Methods* (ECVAM)
- An alternative to the Draize (rabbit eye) test.
- Determines the EC50 of the compound.
- Part of the Zelam testing program.
Pollen Tube Growth Test

Pollen tube is an autonomous multi-cellular organism.
Has no chloroplasts and incapable of photosynthesis.
Different physiological system from root, leaf or whole plant.
Resembles an animal more than plant organ.
Measure the mass production of pollen tubes.
Identify substances which affect germination and/or tube elongation.
Measure photometrically using Alcian Blue.

Pollen Tube Growth Test - harvest
Pollen Tube Growth Test - colour

Pollen Tube Growth Test - example

Pollen Tube Growth Test Results:

- DCOIT active
- Fly Spray
- Encapsulated DCOIT

DCOIT (Value Perm) vs. Material tested.
**Pollen Tube Growth Test - bifenthrin**

**Permatek 100 ENCAPS**

Permatek 100 ENCAPS is a 100g/L capsule suspension of bifenthrin.

For the control of termites on wood products.

Specifically designed for treating EWP’s via addition into the gluemix prior to lay-up and pressing.

Approved by ERMA (NZ) and APVMA (Aus).

Accepted under AS/NZS1604, TUMA & TMA for H2 treating of EWP’s.
Opportunities for Micro-encapsulation

Pressure treatments
Under severe pressure you can move entire micro capsules through to the core of the wood.
Imagine the opportunities for actives delivered right to the site with no screening out of the active.

Opportunities for Micro-encapsulation

Safening
Imagine taking actives that are known irritants and delivering them safely.
A good example may be Deltamethrin.
Opportunities for Micro-encapsulation

Fire retardancy
Imagine a wood protection treatment containing microcapsules of intumescent materials that burst on exposure to heat and provided fire retardancy.

Opportunities for Micro-encapsulation

Colorfastness
Imagine pigment capsules applied with preservative treatments that migrated to the surface (then broke) to minimise colour fade in decking and other outdoor exposed timbers.
End