Removing Timber Preservatives from the Recycled Wood Wastes Stream

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## AS 1604.1^ & NZS 3640:2003*

- Copper chrome arsenic (CCA)**
- Ammoniacal (alkaline)** copper quaternary (ACQ)
- Boron**
- Permethrin**
- Permethrin + IPBC*
- Cypermethrin**
- Deltamethrin**
- Copper azole**
- Creosote
- Tributyltin oxide (TBTO)**
- Tributyltin naphthenate (TBTN)**
- Copper naphthenate**
- Pentachlorophenol (PCP)**
- PCP + TBTO**
- Fluorine compounds (sodium fluoride for H1)**

## What are you looking for?

- Copper
- Arsenic
- Chromium
- Boron
- Tin
- ???????
Manual Sorting

- Visual
- Spray-on indicators (AS/NZS 1605:2000)
- Hand held devices (X-ray fluorescence spectroscopy - XRF)

Visual Sorting

- Is it green, brown, blue, red......?
- Accuracy?
Spray-On Indicators

- AS/NZS 1605:2000
  - Copper
    - Rubeanic Acid (two-part)
    - Chromazurol S
- AWPA 1996
  - PAN (1-(2-pyridylazo)-2-naphthol)

X-Ray Fluorescence (XRF)

- Atom – nucleus and orbiting electrons
- Electron orbits with same energies in the same shells
- Electrons also take up the lowest energy shell possible
XRF Explained

- X-ray hits the atom, and the innermost electron absorbs it and is ejected
- Vacancy in shell
- Higher energy electron moves from its shell to the lower one
- Creates x-ray energy, emitted equals the difference in energy between the two shells
- XRF registers emitted energy
- Compares it to known energies of elements

XRF Aliases

- Energy-dispersive x-ray fluorescence (EDX)
- Wavelength-dispersive x-ray fluorescence
- Commonly manufactured by ASOMA Instruments
XRF Can Identify

- Inorganic elements with atomic numbers greater than sodium
- Not boron or fluorine
- May confuse combination of magnesium and iron with chromium
- Amounts between 10ppm to 100ppm
- 30 sec. to 3 min.

In-Line Sorting

- In-line sensors
  - Laser induced breakdown spectroscopy (LIBS)
LIBS Can Identify

- Most every element (except carbon)
- Down to about 2ppm
- Near real time

Laser Induced Breakdown Spectroscopy (LIBS)

- In-line scanning of waste wood for contaminants
- High intensity laser hits surface of wood → plasma emission and atoms
- Fibre optics collect plasma emission and analyse emitted light using spectrograph
Timber Preservation 2006

Example LIBS Results

CCA Treated timber spectra
Normalised to the 422.7nm calcium emission line
CSIRO 09/09/2005

- Cr I 425.4nm
- Cr I 427.5nm
- Cr I 429.0nm
- Ca I 422.7nm

Normalized intensity (Arbitrary Units)

Wavelength \( \lambda \), (nm)
Content Discriminator

Chromium 425.4 nm Peak Intensity
Normalised to the 422.7 nm Calcium line
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Normalized Peak Intensity (arbitrary units)

Contacts

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