POLYURETHANE (PU) MICROSPHERES & MICROCAPSULES

NCL Innovations: Solutions from CSIR India
Technology

- A novel process for preparation of polyurethane microspheres of uniform shape and size
  - Narrow particle size distribution; Particle size ranging from 1 to 100 micron
  - Molecular weight ranging from 200-2000; Yield ~ 60-85%

- A process for the preparation of polyurethane microcapsules that can encapsulate any chemical of interest, that could be later released when required. For ex.:
  - Biocides
  - Pesticides
  - Anti-microbial agents
  - Disinfectants
  - Etc.

Polyurethane outer layer
Applications

- Paints, enamels and varnishes
- Thickeners in paints, cosmetics, oils, food and textiles
- Electrical insulating varnishes
- Auto brake lining
- Substitute for linseed oil (in manufacturing foundry core oil, which is used as a binder)
- Cement hardening agent
- Used in lamination industry (for reduced brittleness and improved flexibility)
- Adhesive
- Epoxy resins
- Rubber compounding resins
Market Potential

- **Indian paint industry:**
  - Has been growing at 13% over the last five years
  - Predicted to grow by 15% annually over the next five years*

- **Asia Pacific paint market** is expected to grow by 7.9% per year, and top demand over 20 million tons by 2014**

- Powder coatings are increasingly being used to meet the needs of new markets/applications#

- The worldwide powder coating market in 2010 was $2.5 billion^ 

- The market for anti-microbial coatings in the US has been projected to touch $1 billion by the year 2015##

- The use of PU-based coatings in the above markets has been increasing steadily – indicating significant market potential for these products.

*The Indian paint industry...Coatings World, May, 2008 by Parthasarathy Devaraj.
^ Powder Coatings Industry Solutions- An overview, [http://www.malvern.com/ProcessEngIndustries/powder_coatings/overview.htm](http://www.malvern.com/ProcessEngIndustries/powder_coatings/overview.htm) (viewed: 03/05/11)
Value

- **Microspheres**
  - Produces a film or coating of uniform thickness without defects or fat edges
  - Narrow particle size distribution
  - Superior appearance (smoothness, uniform coating thickness)

- **Microscapsules**
  - Can be used for administering various agents such as monocrotophos, pesticides, biocides etc.
  - Can be used to deliver anti-microbial agents
  - Reduce the environmental/mammalian toxicity otherwise caused
  - Controlled Release by microcapsules extends the activity of the agent – increases effective delivery, and longer life
Technology Status, IP Status

- Demonstrated at lab scale
- Several patents granted

**US**
- US 5814675
- US 5859075
- US 5962003
- US 6123988
- US 6239213
- US 20060251688A1 (application)
Links & References

• A Profile of the Asia-Pacific Paint Industry, IRL has published the ninth edition of A Profile of the Asia-Pacific Paint Industry. Published July 6, 2010 http://www.coatingsworld.com/contents/view/24989 - (viewed 03/05/11)

• Antimicrobial coatings: Billion Dollar Bugs: Demand on the rise for antimicrobial coatings- By Tim Pennington, Editor Posted on 04/01/2011 http://www.ptonline.com/articles/antimicrobial-coatings-billion-dollar-bugs (viewed-04/05/11)

• Powder coating: A global value chain perspective- Luks Brun and Ruggero Golini, Center on Globalization, Governance & Competitiveness, Duke University.


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# Technology Summary

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<tr>
<th>Technology title</th>
<th>Polyurethane (PU) Microspheres and Microcapsules</th>
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<td>Industry /sector</td>
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<td>Technology readiness level</td>
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