



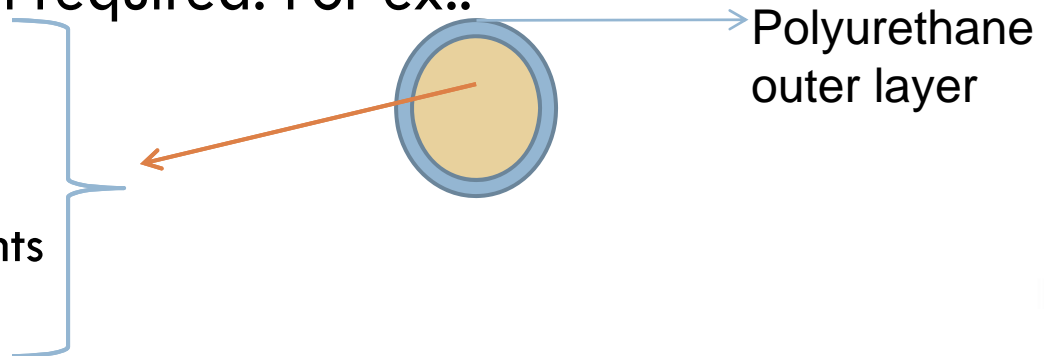
POLYURETHANE (PU) MICROSPHERES & MICROCAPSULES

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.



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.

**A Profile of the Asia-Pacific Paint Industry ,Coatings World, July 6, 2010. <http://www.coatingsworld.com/contents/view/24989> (viewed: 03/05/11)

#Powder coating: A global value chain perspective- L. Brun and R. Golini, Center on Globalization, Governance & Competitiveness Duke University.

^ Powder Coatings Industry Solutions- An overview. http://www.malvern.com/ProcessEng/industries/powder_coatings/overview.htm (viewed: 03/05/11)

##Global Industry Analysts, Inc. February 09, 2011 http://www.prweb.com/releases/anti_microbial_coatings/indoor_air_quality/prweb8121153.htm (viewed: 04/05/11)

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)

❑ Microcapsules

- ❑ 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.
- US Anti-microbial Coatings Market to Reach US\$978.7 Million by 2015, A Report by Global Industry Analysts, Inc. San Jose, CA. (Vocus/PRWEB) February 09, 2011.
http://www.prweb.com/releases/anti_microbial_coatings/indoor_air_quality/prweb8121153.htm (viewed 04/05/11)

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Summary

Technology Summary	
Technology title	Polyurethane (PU) Microspheres and Microcapsules
Industry /sector	Specialty chemicals/Paints
Year of development	1998 onwards
Related patents (with links)	US 5814675 US 5859075 US 5962003 US 6123988 US 6239213 US 20060251688A1
Technology readiness level	Demonstrated in lab scale
Licensing status	No current licenses/Ready to be licensed
Encumbrances	None
Availability	Yes