Information literacy competencies of university students in science and technology for solving research and development problems



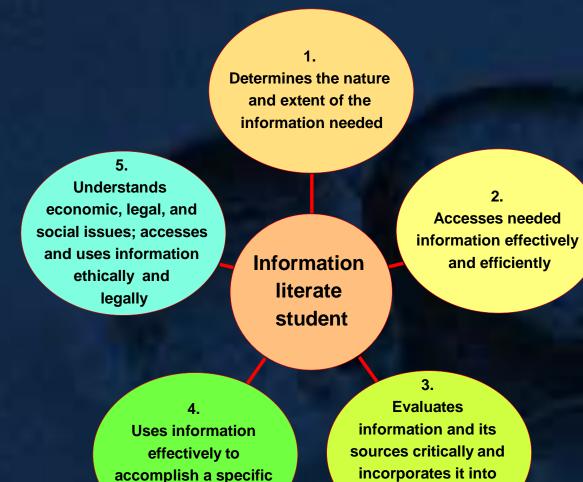
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Information Literacy Competency Standards for Higher Education

Association of College and Research Libraries (ACRL), approved in 2000, currently under revision

http://www.ala.org/acrl/standards/informationliteracycompetency



purpose

knowledge and

values

Problem: When not applied in real-life study and research situations, IL competences and skills may not enable higher cognitive levels such as the use of knowledge, analysis, synthesis and evaluation

Research example: a case study

- Postgraduate programme of scientific and technical informatics
- Combination of heuristic and mathematicalstatistical information methods with experimental laboratory work
- Informatics applied in chemistry: microencapsulation technology and applications

Methodological model

1. Definition of the research field

2. Preparation of profiles for advanced search queries

3. Construction of a specialised in-house information system

4. Analysis, structuring and synthesis of information

5. Design and laboratory verification of selected processes

6 Identification of process parameters - properties relationships

7. Development of a QSPR model

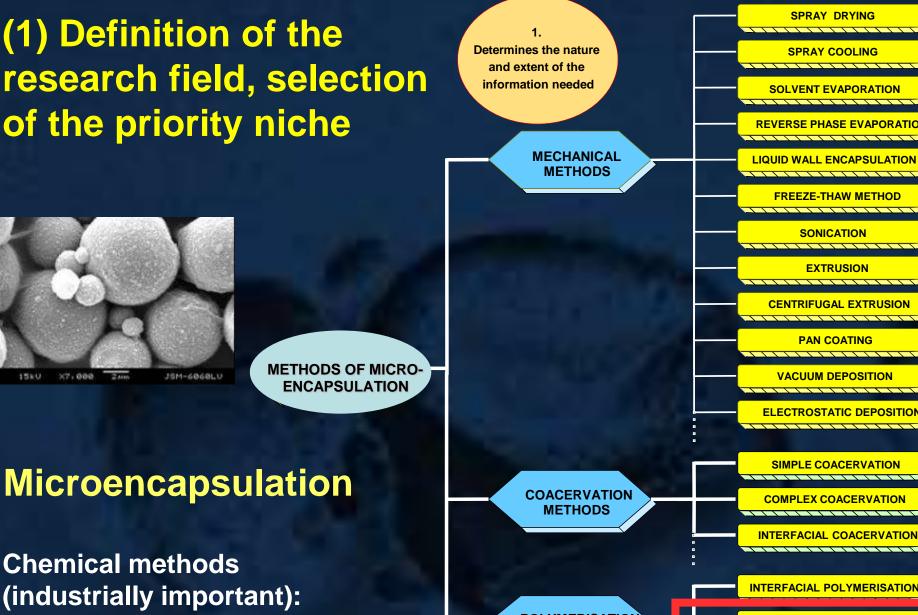
8. Laboratory process optimisation, transfer to industrial reactors

9. Development of new formulations and market products

10. Generalization of the methodology to support R & D activities

Integration of IL competency standards with solving study and research problems in science and technology

(1) Definition of the research field, selection of the priority niche



1. In situ polymerization

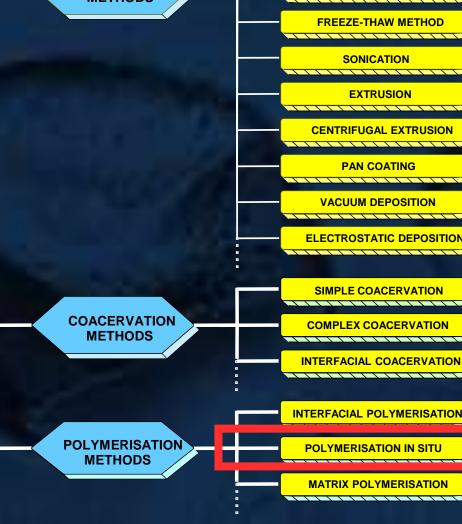
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Chemical methods

JSM-6060LU



(2) Preparation of advanced search profiles for the acquisition of scientific literature and patents

2. Accesses needed information effectively and efficiently

Web of Science®

Advanced Search

Use field tags, Boolean operators, parentheses, and query sets to create your query. Results will appear in the Search History table at the bottom of the page.(Learn more about Advanced Search)

Example: TS=(nanotub* SAME carbon) NOT AU=Smalley RE #1 NOT #2 more examples | view the tutorial

TS=(microcapsul* OR microencapsul*) AND TS= ((polymeri*) AND (in situ)) Advanced search in WoS 333 scientific articles in journals with IF Web of Science http://apps.webofknowledge.com/ basic research



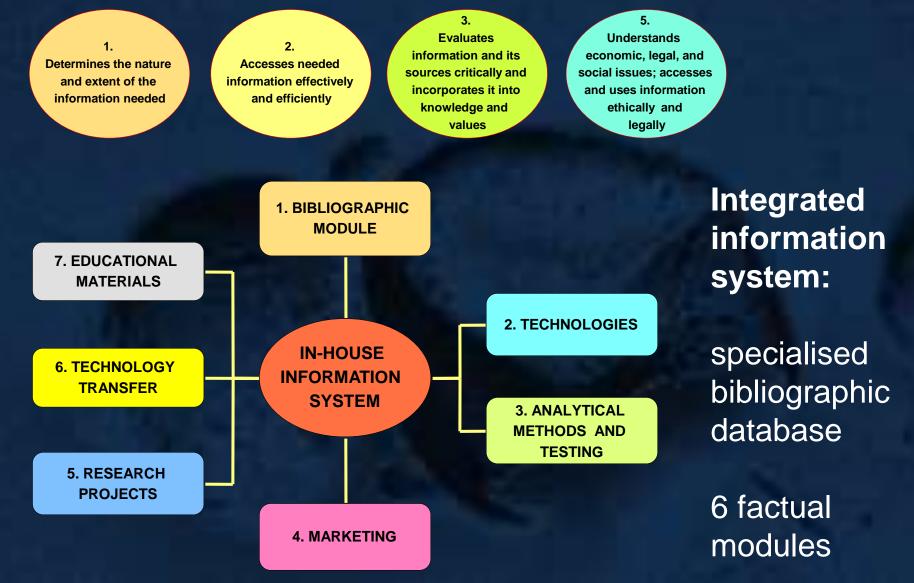
Expert search in FPO 249 patent documents Free Patents Online http://www.freepatentsonline.co m/search.html applied research

Click here for syntax instructions, field abbreviations and character map

ACLM/(microcaps* OR microencaps*) AND ACLM/ ((in situ) AND polymerization) US Patents

- US Patent Applications
- ✓ EP documents
- Abstracts of Japan
- WIPO (PCT)
 - German Patents (Beta)
 - Non-patent Literature

(3) Construction of a specialised in-house information system to support R&D activities



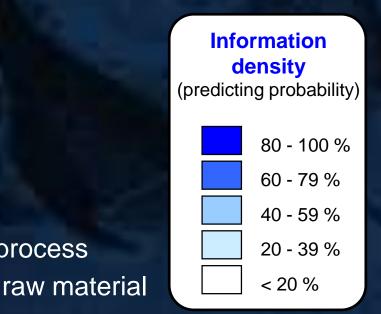
(4) analysis and synthesis of information from full text documents, to identify relationships between raw materials, process parameters and the final properties of microcapsules 4.

Legend

process

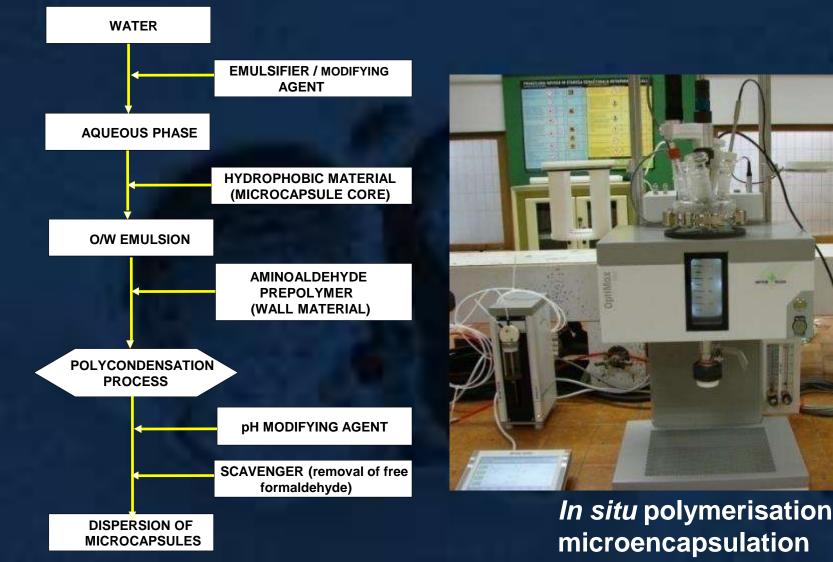
Uses information effectively to accomplish a specific purpose

Analysis of documents Comparison and overlapping of processes **Result:** hypothetical process backbone (for further laboratory optimisation)



(5) Design and verification of selected microencapsulation processes in the laboratory

Uses information effectively to accomplish a specific purpose



(6) Identification of the relationships between the main process parameters and properties of microcapsules, to design a matrix

4. Uses information effectively to accomplish a specific purpose

	PROCESS PARAMETERS									
PROPERTIES	Physico-chemical properties - core	Physico-chemical properties - wall	Physico-chemical prop modifyer	Additives	рН	Temperature	Reactor geometry	Impeller speed	Sequence of operat.	Operation time
MICROCAPSULES:			Acres 1							
Efficacy, yield										
Permeability										
Size										
Size distribution										
Morphology										
								ł		
SUSPENSION OF MK:										
рН										
Viscosity										
Share of microcap.										
Residual monomers										
Production costs										



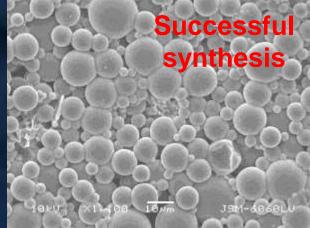
(7) Development of a prediction QSPR (Quantitative Structure-Property Relationship) model to predict the successfulness of microcapsule synthesis

QSPR Microencapsulation Efficiency Coefficient :

 $k\mu = \log P + (\log D/10) + (1-PS/100) + (1-POL/10) + (1-ST/10) + (1-PT/100)$

Legend:

logP (octanol/water); logD (at pH of synthesis); PS polar surface (angstrom²); POL polarizability (10^-24cm³); ST surface tension (dyne/cm); PT vapor pressure at 25°C (mmHg). Uses information effectively to accomplish a specific purpose





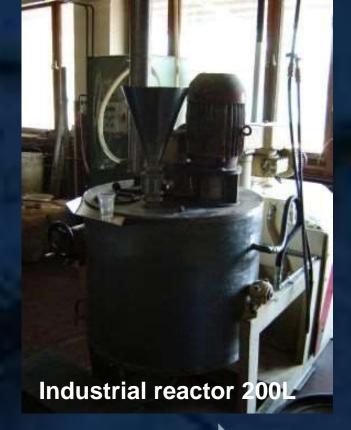
(8) Laboratory microencapsulation of new materials, and transfer of optimized processes into industrial reactors



5. Understands economic, legal, and social issues; accesses and uses information ethically and legally







Laboratory reactor 1L

Pilot industrial reactor 10L



(9) Incorporation of microcapsules into new formulations and market products;

Uses information effectively to accomplish a specific purpose

4.

5. Understands economic, legal, and social issues; accesses and uses information ethically and legally

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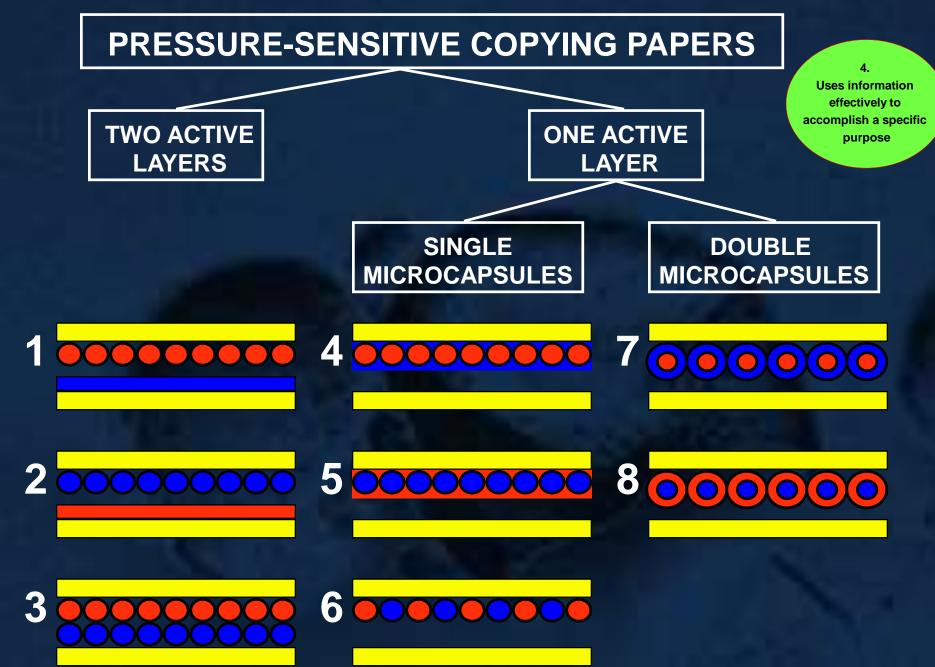
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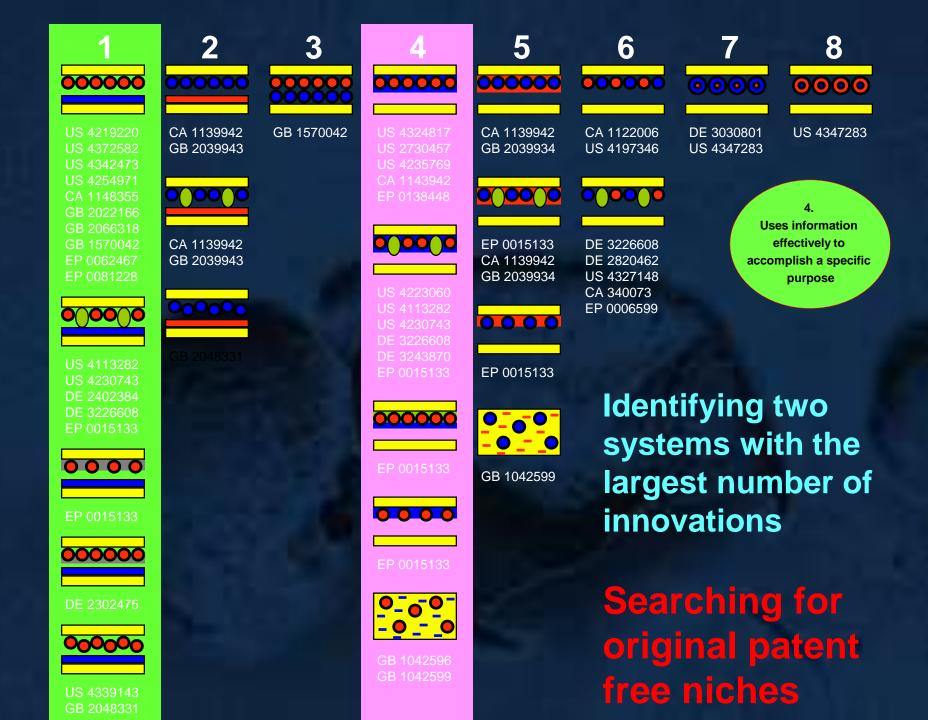
PAPER

MICROENCAPSULATED LEUCO DYE

DEVELOPER

Introducing the methodology of data structuring – prediction matrix





New applications and products

Uses information effectively to accomplish a specific purpose

4

Self-contained printing inks



PAPER

A Discrete Standard Looper, Andream Landard Looper, Standard Looper, Standard Standard Standard Looper, Andream Landard Looper, Landard L

splošne banka koper

Bank mailers with printed microcapsules

Fragranced papers

MICROENCAP-SULATED PERFUME

PAPER



Perfumed paper stickers

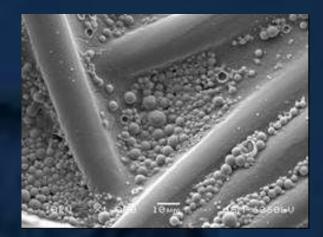
New applications and products

Uses information effectively to accomplish a specific purpose





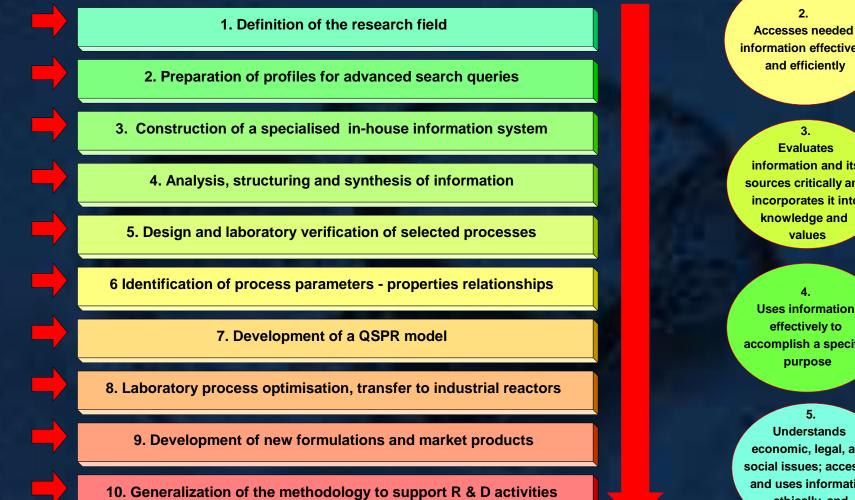
Microencapsulated animal repellents with prolonged activity





Microencapsulated antimicrobial agents for textile shoe insoles

(10) Generalization of the methodology to support R & D activities in academic and industrial environments



Determines the nature and extent of the information needed

1.

Accesses needed information effectively and efficiently

information and its sources critically and incorporates it into knowledge and

effectively to accomplish a specific

Understands economic, legal, and social issues; accesses and uses information ethically and legally

Outcomes / results

- Specialised information system to support R&D
- 2. Scientific and technological innovations scientific articles, patents, market products
- 3. Methodological approach for university education in scientific and technical informatics
- 4. Competent students and researchers

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