



**ROSPATENT**  
FEDERAL SERVICE FOR INTELLECTUAL PROPERTY

# BUSINESS CONSULTING BASED ON PATENT ANALYTICS

AI and other tools & technics. Experience of the Russian Patent Office

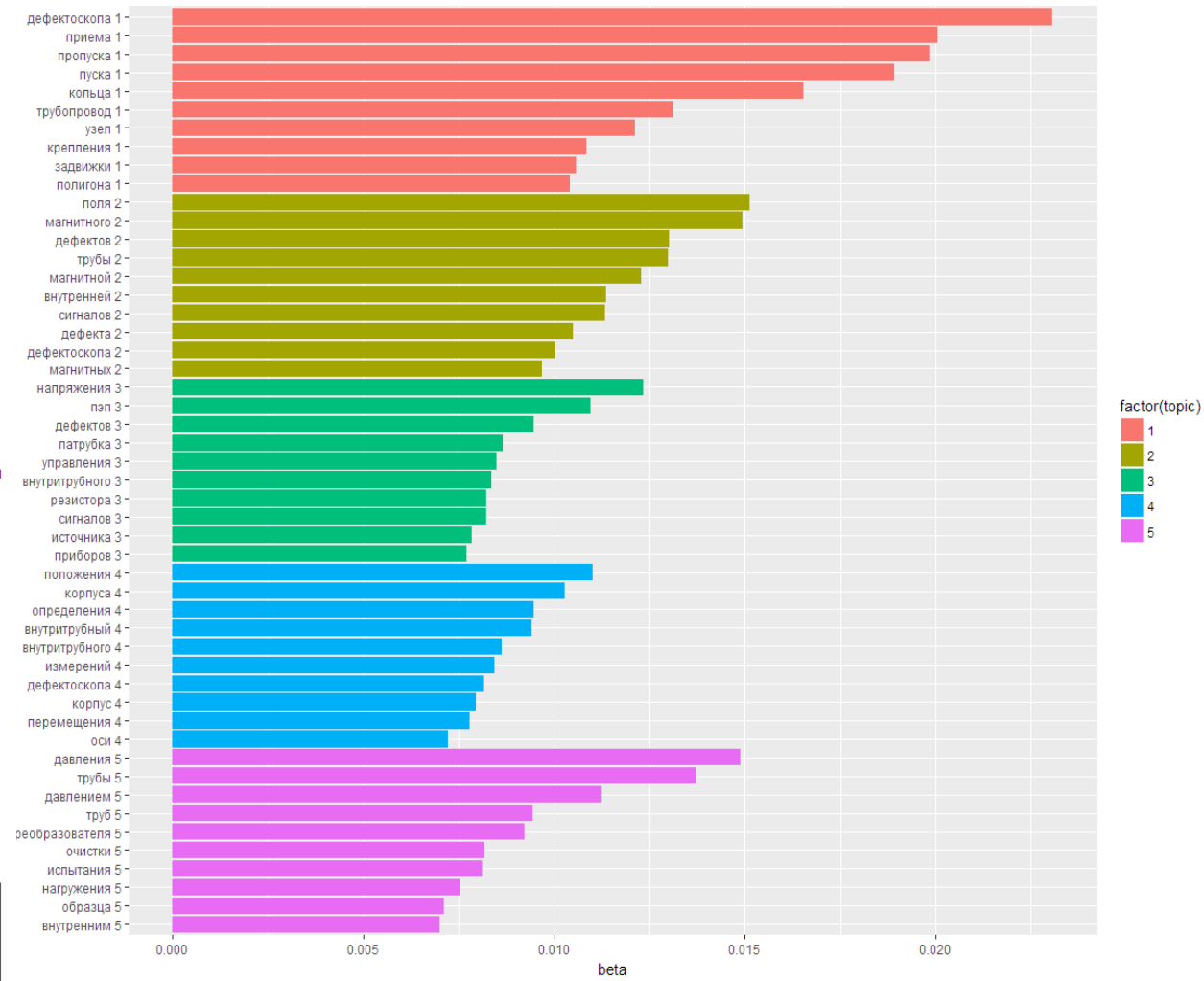
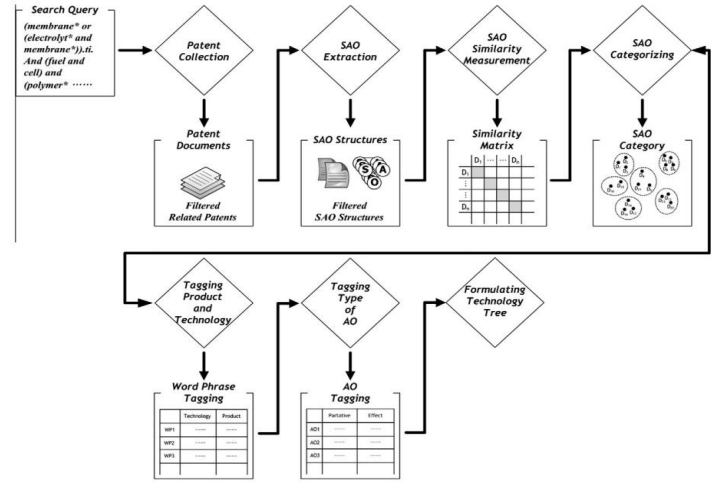
Oleg Ena, PMP<sup>®</sup>

director of the project office

Russian Patent Office, Federal Institute of Industrial Property

# Tools & Technics

- ❑ knowledge formalization
- ❑ topic modelling
- ❑ clusterisation (model-driven, patent structure – driven)
- ❑ machine learning
- ❑ similarity search based on semantic technologies
- ❑ subject-action-object



# Products & Services

## Strategic Level

domain-specific patent landscape	comprehensive study enriched by subject matter experts: trends, technical analysis, strategies, geography, companies, citations, legal status
patent technology intelligence	deep profiling of companies, technologies, products and services in specific technology area

## Operational Level

R&D entourage	R&D prioritization based on a set of business-valued and patent analytics indicators
Analysis of company' patent portfolio, potential of commercialisation	patent portfolio segmentation: by technology areas: express patent landscapes by patent strength: groups of importance, recommendations for commercialisation
patent addendum	patent analytics add-on to the services of 3 <sup>rd</sup> party consulting companies

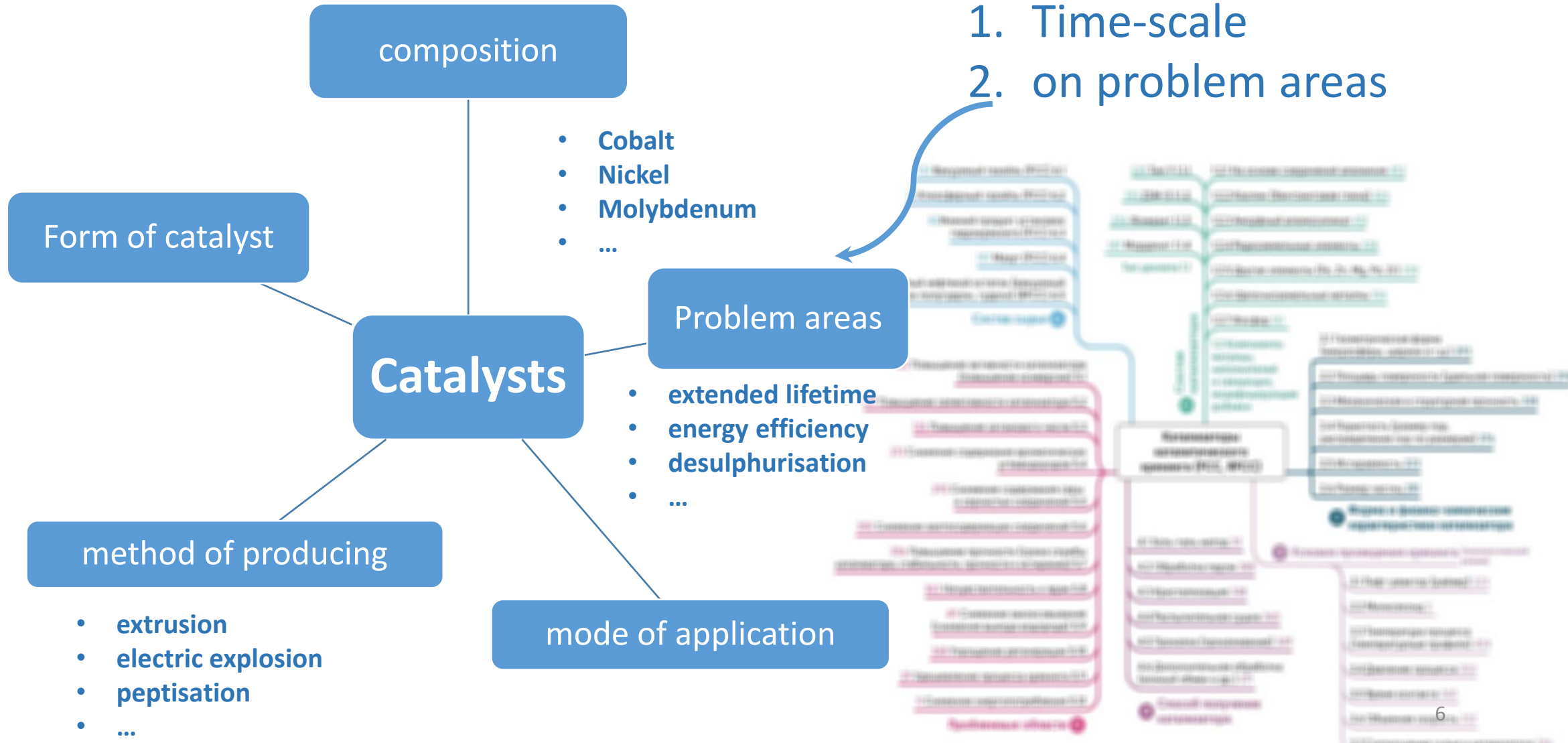
# What questions patent analytics could answer?

- we are going to build a refinery, how do we understand that we are offered the best technologies and that our technologies are properly protected?
- we have a large portfolio of patents, how do we understand which of them are valuable, and which ones can be stopped supporting?
- in our technological areas there are a lot of competing companies, how do we understand what technologies they develop?
- we are offered to invest hundreds of projects a year, how do we understand which ones we need to finance?
- whom we should cooperate with, whom to acquire, what licenses to buy?
- ...

Strategic Level.  
Domain-specific patent landscape

# Research theme decomposition

Cross-analysis:  
1. Time-scale  
2. on problem areas



# Extensive involvement of experts (in-house and external)

□ detailed technical analysis and expert interpretation by 3 groups of experts



1.1.1 – Содержит никель  
 1.1.2 – Содержит молибден  
 1.1.3 – Содержит кобальт

1.2.1 – Содержит цеолит  
 1.2.2 – Содержит алюмосиликат  
 1.2.3 – Содержит Zr, Gf, B  
 1.2.4 – Содержит фосфор

1.3.1 – Оксид кремния  
 1.3.2 – Оксид Алюминия  
 1.3.3 – Оксид других металлов (оксид Ti)

# Technological focus of companies' attention



патенты, имеющие технические решения проблемных областей, например, «высокооктановый бензин». Американская компания **Chevron** также имеет определенную специализацию в разработках. Основные области патентования характеризуют разработки в области кристаллических алюмосиликатов (цеолитов), в частности «цеолитов Y-типа», «аморфных алюмосиликатов» и «новых кристаллических цеолитов». Особое внимание отводится катализаторам, содержащим «благородные металлы». Другая американская компания ExxonMobil равномерно представлена практически



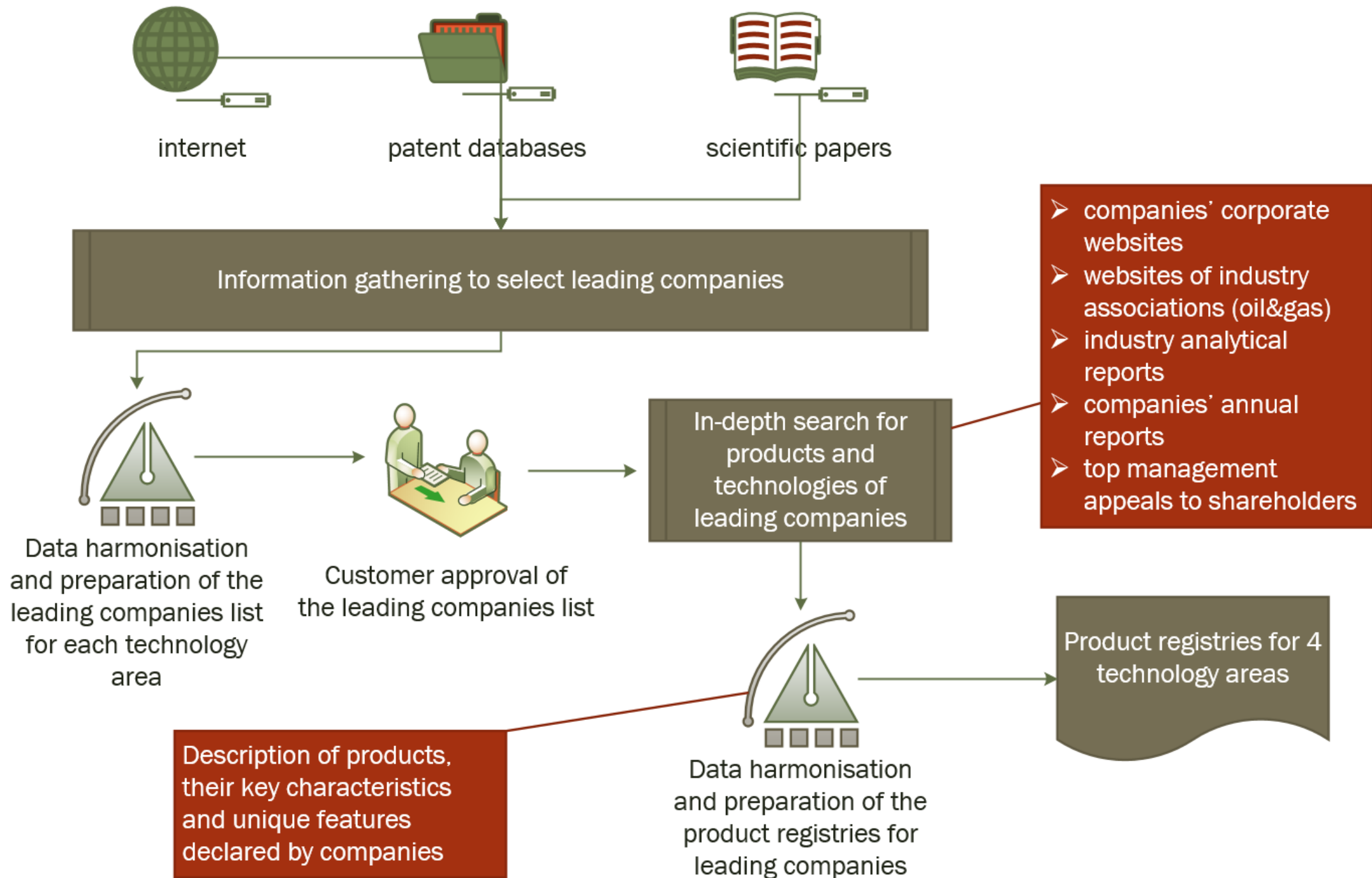
Strategic Level.  
Patent technology intelligence

# Goal

- ❑ a comprehensive study of modern technologies and products of leading companies along several rather narrow technological areas (for example, “alkylation”)
- ❑ research of patent documents, scientific papers and the Internet

# Key results

- ❑ technological profiling of 103 companies in the field of oil refinery
- ❑ 294 technologies that the company develops (produces):
  - ❑ level of maturity for company’s technologies
  - ❑ key technical solutions and patenting features specific to a particular company
- ❑ 233 products that companies put on the global markets:
  - ❑ position relative to other products of technological direction
  - ❑ place of product in the company product line
  - ❑ key advantages and features of the product
- ❑ extensive expert description of the methods of patenting and key features of companies’ technologies



# Dive into technologies

## Ex. Results for one of Albemarle Corporation technology maturity level:

Technology	Patent knowledge	Scientific paper knowledge	Internet knowledge	Maturity level
<b>Albemarle Corporation</b>				
<b>ADZT-100 zeolite technology</b>	<ul style="list-style-type: none"> <li>▪ there is an application for the composition or method of production of the final product;</li> <li>▪ there are separate patents for technology elements or related technologies (for method, catalyst, etc.);</li> <li>▪ there is a patent for the product or the method of its production;</li> <li>▪ there is an application for the technological process with the new product;</li> <li>▪ there are patents for associated technological processes</li> </ul>	<p>Photo-spectroscopy of mixtures of catalyst particles reveals their age and type (2016);            Breakthrough characterization methods for evaluation of metals poisoning in FCC catalyst (2016);            Take ACTION™ to maximize distillate and alkylation feed from your FCC unit (2014);            Process and catalysis factors to <u>maximise</u> propylene output (2012);  <u>Microspectroscopic</u> insight into the deactivation process of individual cracking catalyst particles with basic sulfur components (2012);            Staining of fluid-catalytic-cracking catalysts: <u>Localising Brønsted</u> acidity within a single catalyst particle (2012);            Catalytic activity in individual cracking catalyst particles imaged throughout different life stages by selective staining (2011);            Choosing the advanced option (2010);            Bottom of the barrel economics (2010);            Comparisons of FCC product yields and qualities between reactors using Canadian heavy feeds (2005);            Performance of FCC catalysts prepared with sub-micron y zeolite (2004);            Catalyst assembly technology in FCC. Part II: The influence of fresh and contaminant-affected catalyst structure on FCC performance (2001);            Heavy oil processing. Catalysts (2000)</p>	<ul style="list-style-type: none"> <li>▪ the product (technology) is offered on the market;</li> <li>▪ there are several products based on one technology</li> </ul>	stack of technologies (technology tree)

# Dive into products

Complex analysis of the company's product line

FCC CATALYSTS

ALBEMARLE®



**CORAL™ FCC catalysts** – Improving residue FCC unit performance through enhanced catalyst accessibility

### Mass transfer limitations

Many FCC units experience losses in conversion and bottoms selectivity as a result of mass-transfer limitations. These are due to the problems that high-molecular-weight, sterically hindered feed molecules experience when diffusing into catalyst particles.

Albemarle offers the breakthrough catalyst CORAL to overcome this problem, especially in residue FCC units.

Figures 1 and 2 show the presence of an inflection point in the accessibility curves. These yield shifts are consistent for all mass transfer-limited operations. The absolute value of the inflection point differs unit by unit, but the trends are consistent. For this FCC unit, the critical accessibility, shown by the dashed line, is about 4.5.



## 2.1.3.4. Albemarle

ACTION			CORAL		
AMBER			UPGRADER		
GO-ULTRA			AFX		

Patent Search & Analytics.  
Proposal for the broader AI coverage

## Catalytic hydroconversion of the extraction residue from Naomaohu lignite over an active and separable magnetic solid superbase (Article)

Zhang, M.<sup>a</sup>, Wei, X.-Y.<sup>ab</sup>, Yang, Z.<sup>a</sup>, Teng, D.-G.<sup>a</sup>, Xue, Y.<sup>a</sup>, Meng, D.-W.<sup>a</sup>, Zong, Z.-M.<sup>a</sup>

<sup>a</sup>Key Laboratory of Coal Processing and Efficient Utilization, Ministry of Education, China University of Mining & Technology, Xuzhou, Jiangsu, China

<sup>b</sup>State Key Laboratory of High-efficiency Coal Utilization and Green Chemical Engineering, Ningxia University, Yinchuan, Ningxia, China

### Краткое описание

[Просмотр пристатейных ссылок \(30\)](#)

A highly active magnetic solid superbase (MSSB) was prepared by impregnating Mg<sub>2</sub>Si onto  $\gamma$ -Al<sub>2</sub>O<sub>3</sub>-coated ferroferric oxide nanoparticles via one-pot synthesis method and successfully applied in the catalytic hydroconversion (CHC) of the extraction residue (ER) from Naomaohu lignite. Large amounts of chain alkanes and arenes were detected in the soluble portion (SP) from the non-catalytic hydroconversion of the ER, while oxygen-containing organic compounds are predominant in the SP from the CHC of the ER, indicating that MSSB could effectively reduce the oxygen content of the ER. Oxybis(methylene)dibenzene was used as the lignite-related model compound to evaluate the catalytic activity of MSSB. The results show that MSSB could effectively reduce the oxygen content of the ER through subsequent H<sup>+</sup> transfer, leading to the cleavage of C–O bridged bonds. © 2018 Elsevier Ltd

### Reaxys Database Information

[View Compounds](#)

### Ключевые слова автора

Catalytic hydroconversion C–O bridged bonds Magnetic solid superbase Naomaohu lignite

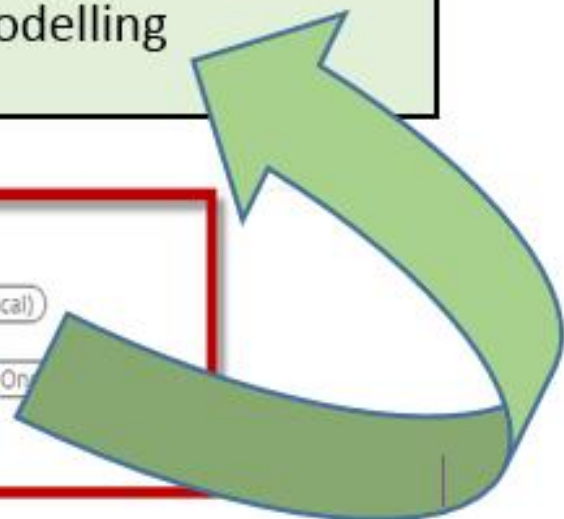
### Включенные в указатель ключевые слова

Engineering controlled terms: Alumina Aluminum oxide Catalyst activity Extraction Lignite Magnesium compounds Nanomagnetism Synthesis (chemical)

Compendex keywords: Extraction residue Ferroferric oxides Hydroconversion Large amounts Magnetic solids Model compound Non-catalytic

Engineering main heading: Hydrocracking

- automatic processing
- automatic classification
- automatic categorization
- thematic filtering
- topic modelling










# Solution

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- Stage 1
- Develop an extension to the ST.96 standard: 'domain-specific key terms' (XML4IP)
  - Disseminate standard extension among patent analytics providers and national patent offices
- Stage 2
- Usage of the new standard extension by patent analytics providers (non-harmonised, with their own principles of keywords filling)
  - Development of the tools oriented to extended section processing
  - Promotion of the new technology-valued section of patent documents through patent analytics community
  - Research study (WIPO, providers, patent offices): 'Mature approach for usage of subject-oriented taxonomies' (oil & gas, pharma, medicine, energy etc.). Research consists of work packages, main deliverables:
    - the set of domain-specific taxonomies (10-15 taxonomies linked to 35 WIPO technology areas)
  - methodology guidelines 'how to process patent documents and define taxonomy coverage for a patent document'
- Stage 3
- Usage of the new standard extension by patent analytics providers and national patent offices (harmonised, based on methodology guidelines and a set of pre-defined trusted taxonomies)
  - Elaboration on full coverage of technological areas
-



# Enrichment of patent documents

	Current state	Stage 1	Stage 2	Stage 3
Documents	<div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Patent Document XML specification (ST.96)</div> <div style="border: 1px solid gray; padding: 5px;">bibliography </div>	<div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Patent Document XML specification (ST.96)</div> <div style="border: 1px solid gray; padding: 5px;">bibliography </div> <div style="border: 1px solid gray; padding: 5px; margin-top: 10px;">ST.96 Standard extension </div>	<div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Patent Document XML specification (ST.96)</div> <div style="border: 1px solid gray; padding: 5px;">extended (bibliography + keywords) </div> <div style="border: 1px solid gray; padding: 5px; margin-top: 10px;">Research study deliverables </div>	<div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Patent Document XML specification (ST.96)</div> <div style="border: 1px solid gray; padding: 5px;">extended (bibliography + keywords) </div> <div style="border: 1px solid gray; padding: 5px; margin-top: 10px;">Taxonomies &amp; guidelines </div>
Support	<div style="border: 1px solid gray; padding: 10px; text-align: center;">---</div>	<div style="border: 1px solid gray; padding: 5px;">ST.96 extension : 'domain-specific key terms' (XML4IP)</div>	<div style="border: 1px solid gray; padding: 5px;">ST.96 extension : 'domain-specific key terms' (XML4IP)</div> <div style="border: 1px solid gray; padding: 5px; margin-top: 10px;">Research study</div>	<div style="border: 1px solid gray; padding: 5px;">ST.96 extension : 'domain-specific key terms' (XML4IP)</div> <div style="border: 1px solid gray; padding: 5px; margin-top: 10px;">set of taxonomies</div> <div style="border: 1px solid gray; padding: 5px; margin-top: 10px;">methodology guidelines</div>
Usage	<div style="border: 1px solid gray; padding: 10px; text-align: center;">Classic</div>	<div style="border: 1px solid gray; padding: 10px; text-align: center;">dissemination of the standard</div>	<div style="border: 1px solid gray; padding: 10px; text-align: center;">non-harmonised keywords filling</div>	<div style="border: 1px solid gray; padding: 10px; text-align: center;">harmonised keywords filling based on guidelines and pre-defined taxonomies</div>

## Main goal

- ❑ Enrich patent documents with domain-specific data valuable for refined search & analysis

## Effects

- ❑ increase of quality – more accurate determination of patent document technology topics
- ❑ reduction of the resource-intensive efforts: time and cost
- ❑ widening of the functions and possible usage scenarios of the patent analytics tools
- ❑ stimulation of the processing tools development



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