

# BISMUTH NANOPARTICLES – TECHNOLOGY LANDSCAPE

TECHNOLOGY THROUGH PATENT GLASS

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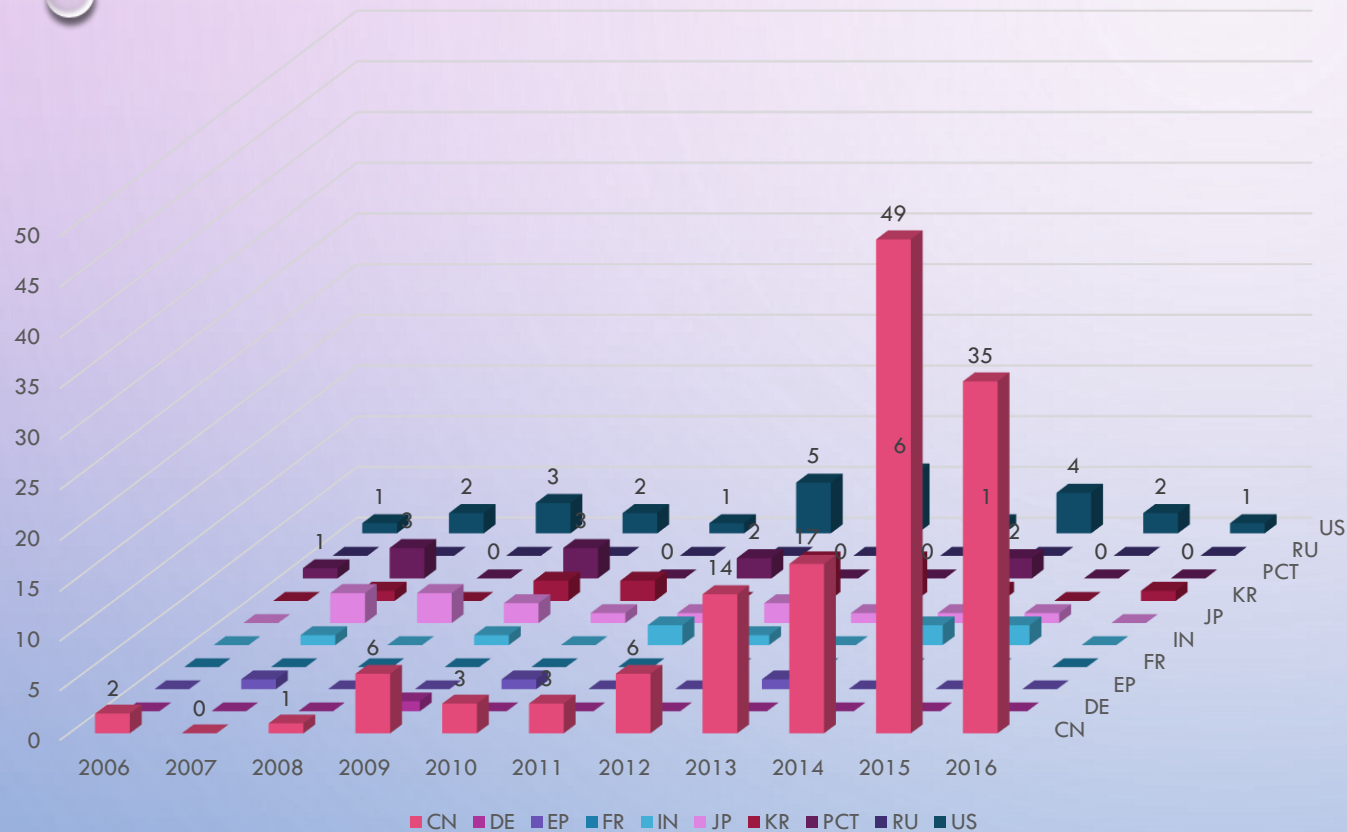
# WHY USE PATENTS AS TECHNOLOGY INDICATOR

- PATENTS PROVIDE CLEAR IDEA OF NUMBER OF PLAYERS IN MARKET FOR A PARTICULAR TECHNOLOGY
- PATENT DATA PROVIDES AN ACCURATE UNDERSTANDING OF TECHNICAL DOMAINS WHEREIN A PARTICULAR TECHNOLOGY HAS BRANCHED INTO
- PATENT DATA HELPS TO UNDERSTAND HOW TECHNOLOGY HAS CHANGED OVER THE YEARS. FOR EXAMPLE, PATENT DATA CAN PROVIDE EVIDENCE OF WHAT TECHNICAL DOMAINS WERE BEING RESEARCHED INTO A DECADE AGO AS COMPARED TO TECHNICAL DOMAINS BEING RESEARCHED TODAY.
- SUCH A COMPARISON HELPS IN MAPPING OUT PROGRESS OF A TECHNOLOGY, KNOWLEDGE EXTERNALITIES AND CROSS INDUSTRY INNOVATION PROSPECTS
- ALL THE ABOVE MENTIONED POINTS BARELY SCRATCH THE SURFACE OF OCEAN THAT IS PATENT DATA ANALYSIS
- IN THIS REPORT WE AIM TO PRESENT FEW EXEMPLARY CONCLUSIONS THAT WE COULD DRAW FROM A DETAILED ANALYSIS OF BISMUTH NANOPARTICLE TECHNOLOGY.

# BISMUTH NANOPARTICLES

- BISMUTH IS A CRYSTALLINE, BRITTLE METAL AND CONSTITUTES THE MOST NATURALLY DIAMAGNETIC METAL. TYPICALLY, BISMUTH IS FOUND AS BISMUTHINITE (BISMUTH SULFIDE), BISMITE (BISMUTH OXIDE) AND BISMUTHITE (BISMUTH CARBONATE)
- BISMUTH HAS THE PROPERTY THAT IT EXPANDS AS IT FREEZES AND ALSO HAS UNUSUALLY HIGH ELECTRICAL RESISTANCE FOR A METAL. ITS THERMAL CONDUCTIVITY IS LOWER THAN ANY METAL EXCEPT MERCURY
- BISMUTH IS A SEMIMETAL WITH RHOMBOHEDRAL CRYSTAL STRUCTURE AND BI SHOWS A SEMIMETAL-SEMICONDUCTOR TRANSITION IN LOW-DIMENSIONAL STRUCTURES, HENCE MAKING IT A CANDIDATE FOR NANOTECHNICAL APPLICATIONS.
- THIS PRESENTATION AIMS AT PRESENTING A TECHNICAL LANDSCAPE OF BISMUTH NANOPARTICLES. AMONGST OTHERS, INCLUDED IN PRESENTATION ARE:
  - EVOLUTION OF BISMUTH NANOPARTICLE TECHNOLOGY
  - MAJOR TECHNOLOGY VERTICALS WHEREIN BISMUTH NANOPARTICLES ARE BEING USED
  - MAJOR TECHNICAL PLAYERS IN FIELD OF BISMUTH NANOPARTICLES
  - GEOGRAPHICAL DISTRIBUTION OF BISMUTH NANOPARTICLES
  - TECHNOLOGY INFLUENCE OF PATENT PORTFOLIOS HELD BY MAJOR PLAYERS AND VARIOUS JURISDICTIONS IN BISMUTH NANOPARTICLE TECHNOLOGY
  - MARKET POWER OF PATENT PORTFOLIOS HELD BY MAJOR PLAYERS VARIOUS JURISDICTIONS IN BISMUTH NANOPARTICLE TECHNOLOGY
- WE HAVE USED PATENTS ARE OUR INDICATORS FOR MAPPING BISMUTH NANOPARTICLE TECHNOLOGY.

## Technology Evolution

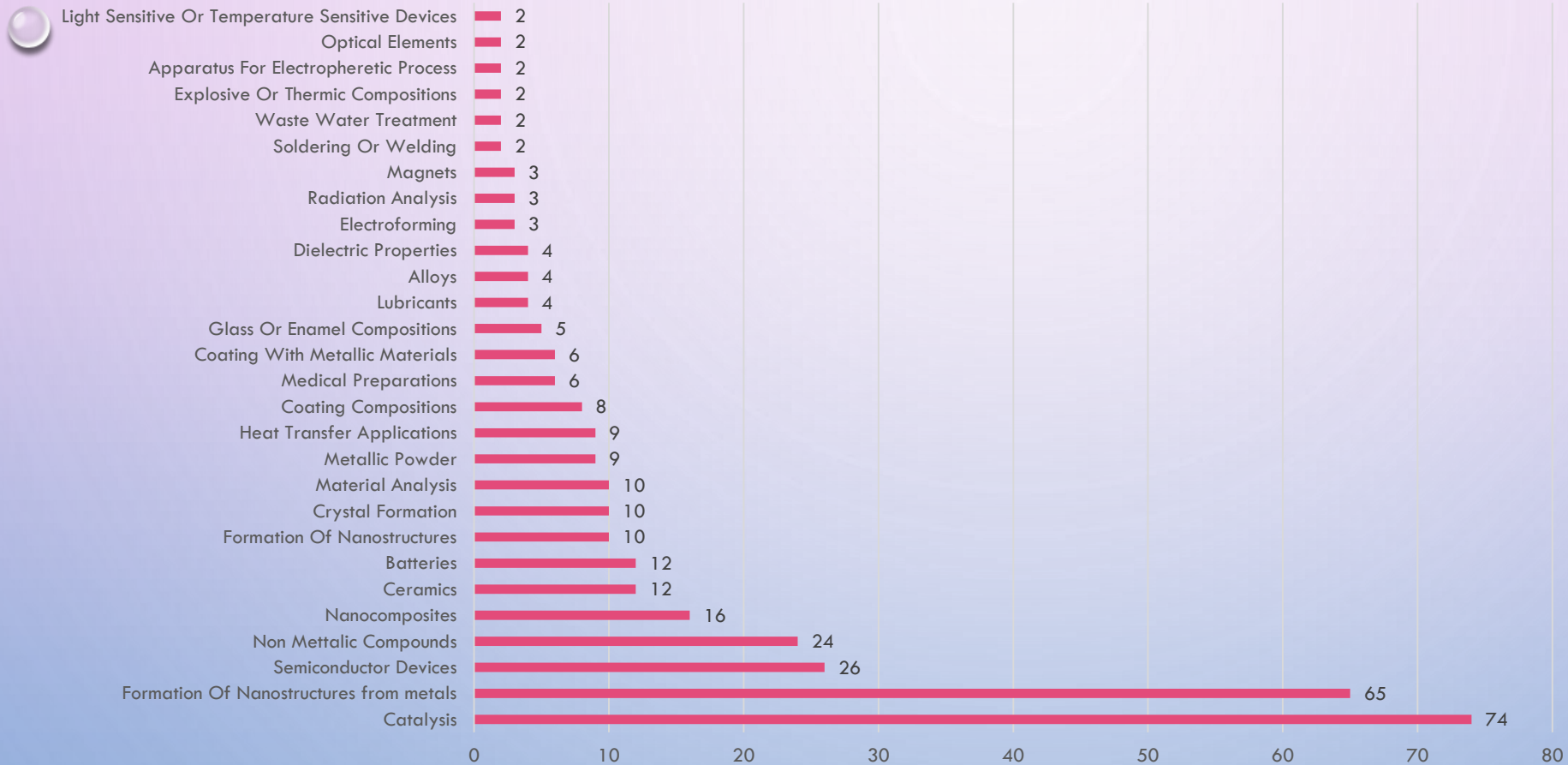


The chart illustrates how bismuth nanoparticle technology has evolved from 2006 till 2016 in various jurisdiction.

The parameters used to make this chart are

1. Number of patent published from year 2006 to 2016
2. Jurisdiction across the globe where those patents have been published

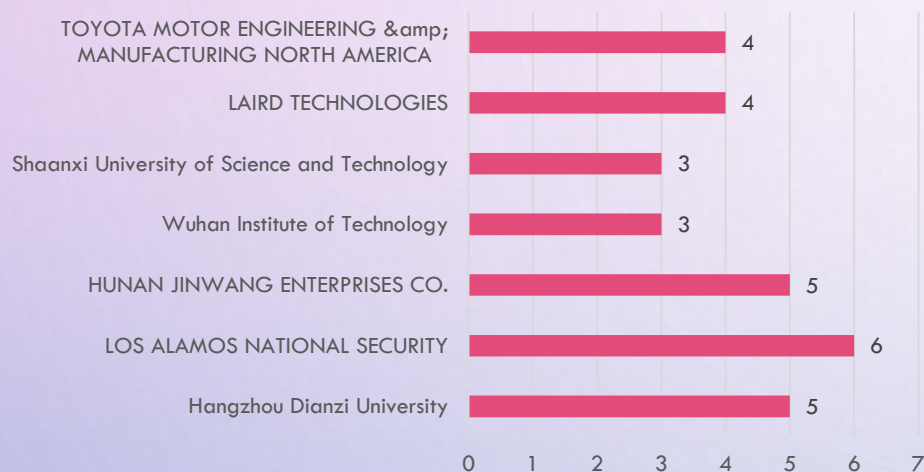




This chart illustrates various application areas wherein bismuth nanoparticle technology has been exploited

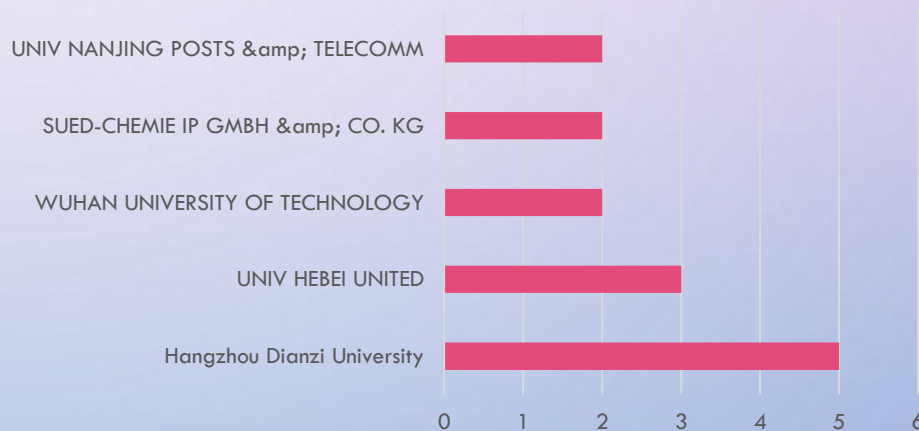
The chart of also illustrates level of exploitation of each technical area

### Top Players for Catalysis Applications



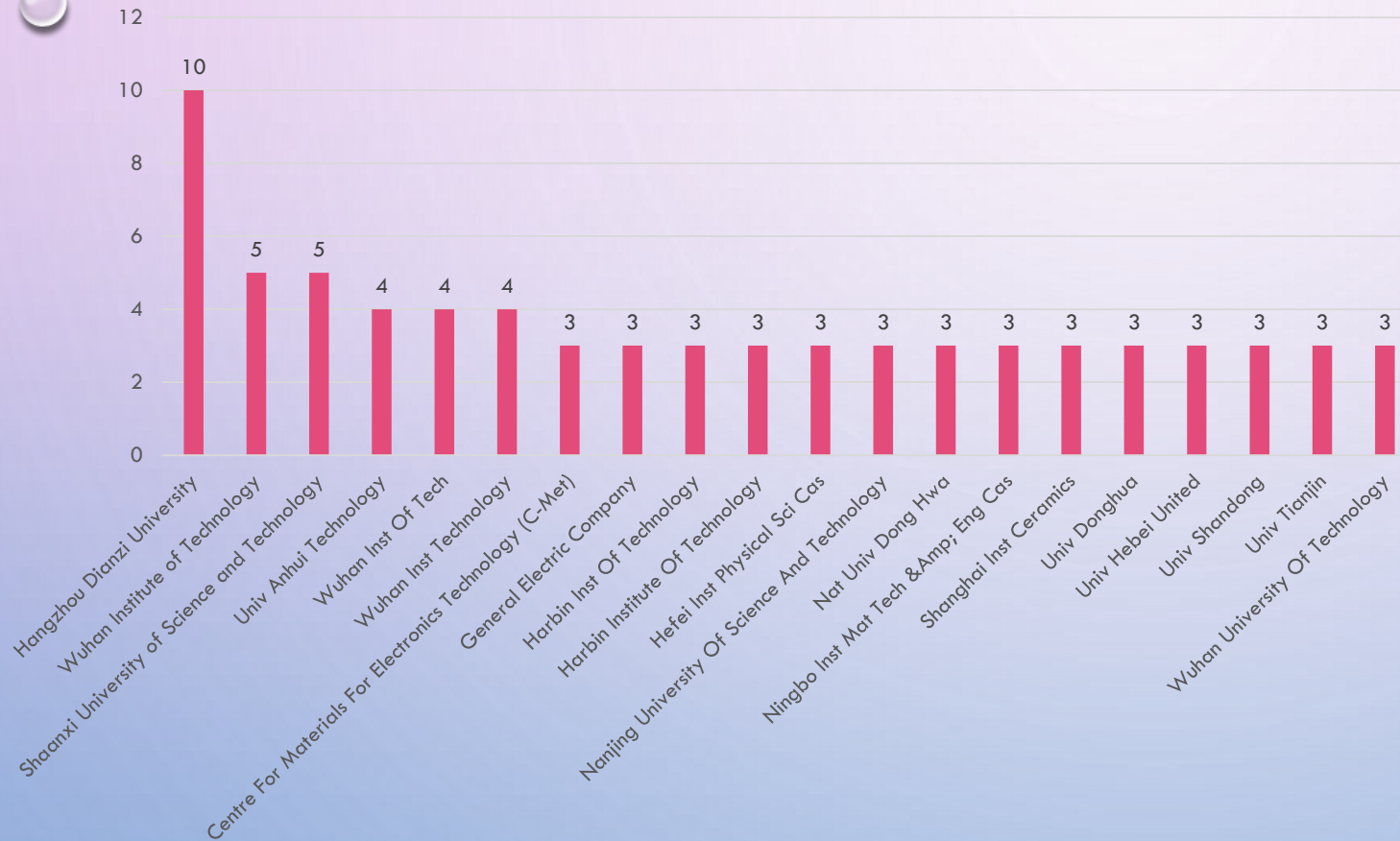
The 2 charts illustrated in this slide indicate that while corporate sector is playing a role in development of bismuth nanoparticle technology, it is academic institutes that have been forthcoming with new innovations in this field

### Top Players for formation of nanoparticles for Bismuth nanoparticle technology



In complete report of Bismuth Nanoparticles – A technology landscape we present world leaders for every application of bismuth nanoparticles that is listed in previous slide

Top Players in Field of Bismuth Nanoparticle Technology

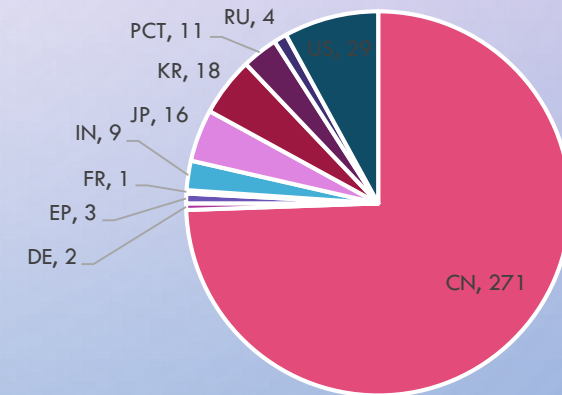


The chart above illustrates academia ahead of corporate for bismuth nanoparticle technology

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The chart below illustrates china as world leader for bismuth nanoparticle technology

Geographical Distribution of Bismuth Nanoparticle Technology

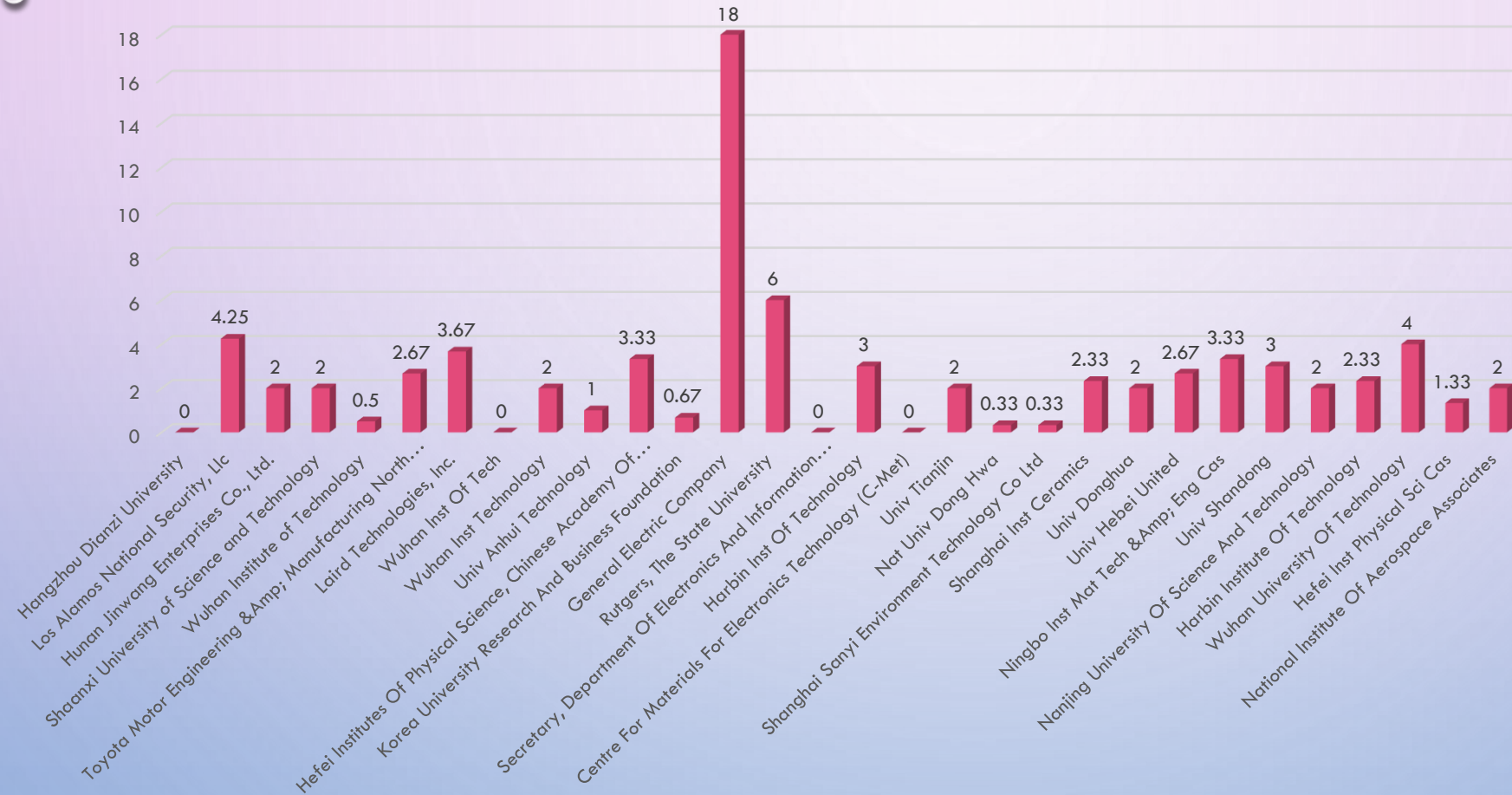


■ CN ■ DE ■ EP ■ FR ■ IN ■ JP ■ KR ■ PCT ■ RU ■ US

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### Technology Influence



Technology influence refers to trickle down effect that particular technology has had over development of bismuth nanoparticle technology.

We have done a detailed citation analysis and indexing for arriving at these conclusions



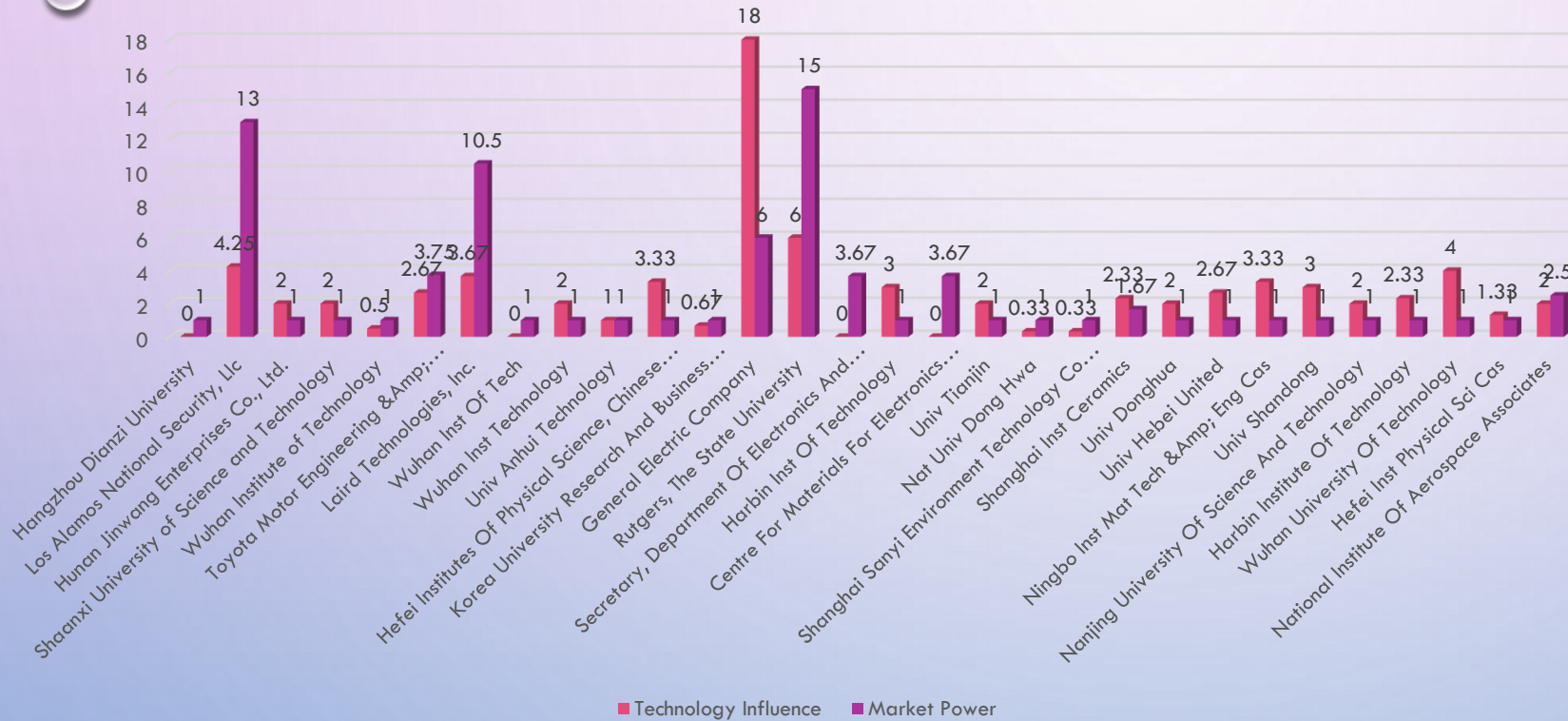
## Market Power



Market Power refers to size of a portfolio and its potential in commercialization.

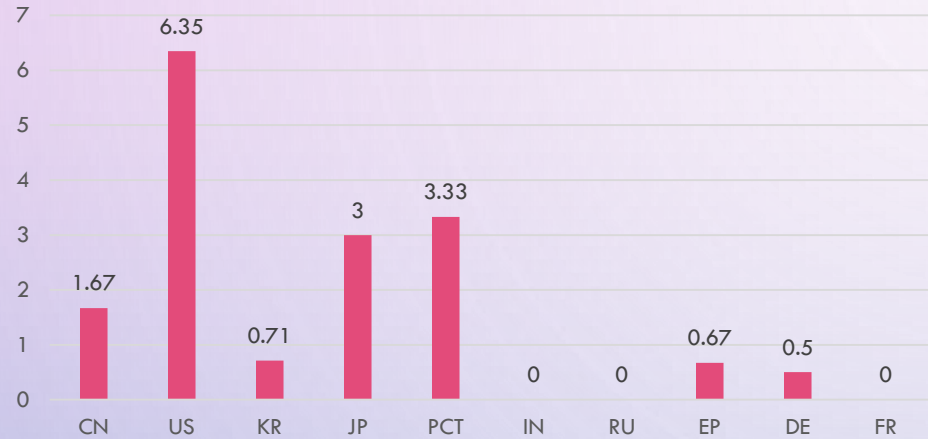
In order to calculate market power we have done detailed patent family size analysis and indexing for every assignee

Comparison of Market Power and Technology Influence of each Assignee



The comparison indicates that it is not necessary of biggest technology influencing player to hold maximum market power as well.

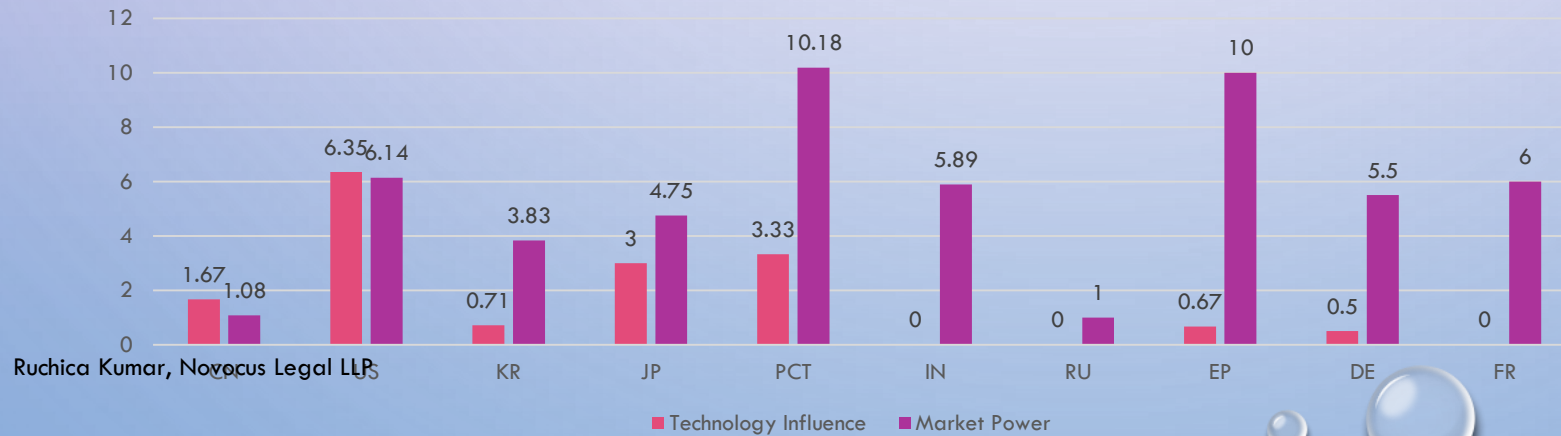
Technology Influence for Various Patent Jurisdictions



Market Power for Various Patent Jurisdictions



Comparison of Technology Influence and Market Power for Various Patent Jurisdictions



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# WHAT THIS PRESENTATION DOES NOT INCLUDE:

- **THE BISMUTH NANOPARTICLE MARKET IS SEGMENTED BASED ON PRODUCTS AND SERVICES, APPLICATIONS, END USERS, AND REGIONS.**
- **NOVEL PRODUCTS IN THE MARKET**
- **GEOGRAPHICAL DISTRIBUTION WITH RESPECT TO YEARS, ASSIGNEES, TECHNICAL APPLICATIONS**
- **CO-ASSIGNMENT ANALYSIS**
- **IP COMPETITIVENESS DETAILS AMONG VARIOUS ASSIGNEES AND VARIOUS JURISDICTIONS**
- **MOST EXPLORED TECHNICAL APPLICATIONS**
- **WHITE SPACES IN BISMUTH NANOPARTICLE TECHNOLOGY**
- **UPCOMING APPLICATIONS FOR BISMUTH NANOPARTICLE TECHNOLOGY**



## About the Author

**Mrs. Ruchica Kumar** - An Intellectual Property professional and a registered patent agent who has been working in the highly specialized and focused field of Patent Management. As a registered patent agent she has drafted and prosecuted various patent applications. Her work is focused on technical and strategic facets of patent management involving patent analytics, acquisition and management. Her area of specialization is patent informatics wherein, she leverages technical aspects of patent drafting, patent valuation and patent citations to generate comprehensive patent intelligence data. Her sound technical skill set amalgamated with a strong patent knowledge base provides her good understanding of dynamics of cross industry innovation.

Her competencies include:

- Innovation Forecasting – Analyzing knowledge spill-overs and externalities for forecasting new innovation areas for an organization using patents as indicators
- Patent Drafting in fields of Medical surgical devices and implants, cardiac rhythm management devices, urology, gynecology.
- Patent Invalidation and Patentability assessment
- Technology infusion and diffusion studies using patents as indicators
- Licensing and Technology Transfer in fields of general engineering
- Indian Patent filing and prosecution
- Technology Mapping
- Pre-litigation due diligence

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## Contact Us

- We welcome any queries regarding any of the topics you found interesting. We would be happy to provide more details on any of the topics you desire. Also, any queries regarding any issues related to intellectual property are most welcome.
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