

Patent indicators for the Spanish Nanotechnology domain

Victor Herrero-Solana[†], Björn Jürgens^{**}

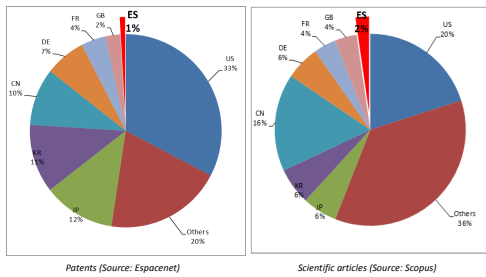
[†] SCImago-UGR (SEJ036), Universidad de Granada, Granada, Spain. E-mail: victorhs@ugr.es

^{**} CITPIA Patent Information Centre, Agency of Innovation and Development of Andalusia, Seville, Spain. E-mail: bjurgens@agenciaidea.es

This poster presents the indicators of a patentometric study of Spanish nanotechnology [1] that was presented in a Nanotech Event [2]. The analysis was conducted for the years 2004 to 2014 and the search strategy was based on keywords of a established query [3] and relevant patent classifications. As a patent data source the database *Espacenet-Worldwide* from the European Patent Office was used since a previous study from the authors showed that it provided the best data coverage for the purpose of the study [4]. More than 3400 patent records with Spanish authorship were retrieved and after an exhaustive data harmonization process a patentometric analysis was performed using the software tool *Matheo Patent*. For a patent/paper comparison furthermore scientific article data was retrieved from *Scopus*. Subsequently several indicators were generated which we grouped into the following types: *Performance indicators*, *Technology network indicators*, *Collaboration indicators* and *Patent value indicators*.

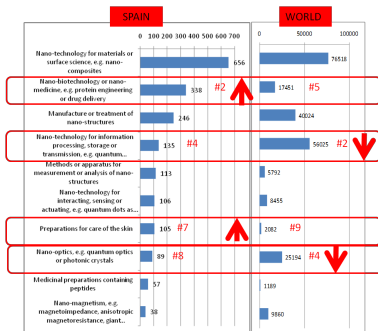
Spain vs. World

Spanish patenting in Nanotechnology was compared to worldwide patenting and publishing. By launching the search query to the total worldwide database and to applicant affiliations of seven important Nano output countries we could see how the Spanish nanotechnology is behaving compared to an international basis. Two types of countries could be identified (see Figure 1): On the one hand a group comprising the United States, Japan and South Korea where the production of patents is relatively higher than the scientific production. On the other hand a group with the opposite behaviour, which includes especially China and to a lesser extent the UK and Spain. Spain intervenes at 1% of the patents on nanotechnology in the world, but has more than double the representation for scientific papers.



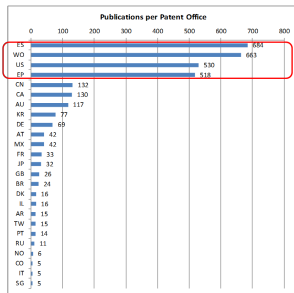
Thematic profile

Regarding the Spanish Nanotechnology thematic profile we compared it with worldwide patenting and could identify an above average patenting in the field of nano-medicine and nano-biotechnology. On the contrary we found a deficit in patents related to nano-optics, nano-magnetism and nanotechnologies related to information and communication technologies (ICT). In the field of materials science related to nanocomposites, production is equivalent in relative terms to the rest of the world.



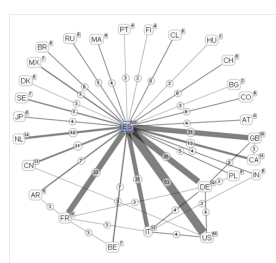
Publications per patent office

By identifying the patent authorities where the applicants file their patents we can see which countries or patent systems were considered of interest for the applicant to protect their invention. As expected from patents with Spanish authorship most patents were filed at the Spanish patent office (ES), but closely followed by filings of PCT applications (WO) at the World Intellectual Property Organization. The third and fourth most important patent filing destination was the US and the European Patent Office (EP). It is interesting to see that China, seems to have overtaken Japan as a more desirable patenting destination for Spanish nanotechnology.



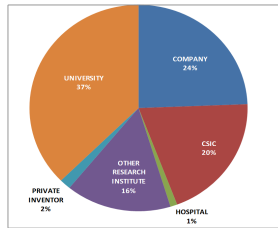
Country collaboration

Regarding the co-authorship of inventors from Spain with inventors from other countries most collaboration in nanotechnology patents is done with inventors from the US, followed by Germany, Great Britain and France as can be observed in the following network map.



Sector affiliation

If we analyze the patent output according to its applicant's sector affiliation the universities are prevalent (37%), followed by private enterprises (24%), the CSIC (20%) and other research centres (16%).



Patent internationalization ratio

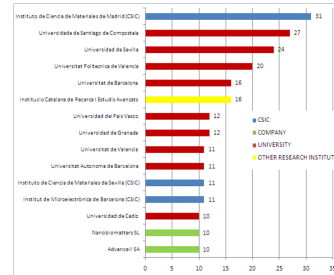
In order to measure the effort of internationalization we describe an indicator, which is a ratio between the number of patent registrations (in different offices) and patent families (the invention or innovation itself) and can be used to measure the value of patents.

When we analyze the rate of internationalization in Spain, we find that the highest values are presented by the companies, whose business model is based on the protection of such innovations and therefore are willing to such an effort. Some universities appear to have higher capacity of internationalization than the CSIC centres. The institutions which really stand out are the *Universidad de Sevilla* and the *Universidad de Santiago de Compostela*. Both have such a positive productive behaviour that a further study of their technology transfer offices (TTO) would be of interest.

Applicants (All sectors)	Patent families	Patent records	Patent IR (records/family)
Salvat Lab SA	1	20	20
Grifols SA	2	35	17.5
Interquim SA	1	14	14
Silicalia SL	2	26	13
Dermicos SL	1	13	13
Tcd Pharma SL	1	13	13
Nylstar SA	1	12	12
Hospital De La Santa Creu I Sant Pau	1	11	11
Hospital Universitari Germans Trias I Pujol	1	11	11
Tolsa SA	1	11	11
AdvanCell SA	10	104	10.4
Biotron Microbiosensores SL	1	10	10
Histocell SL	1	10	10

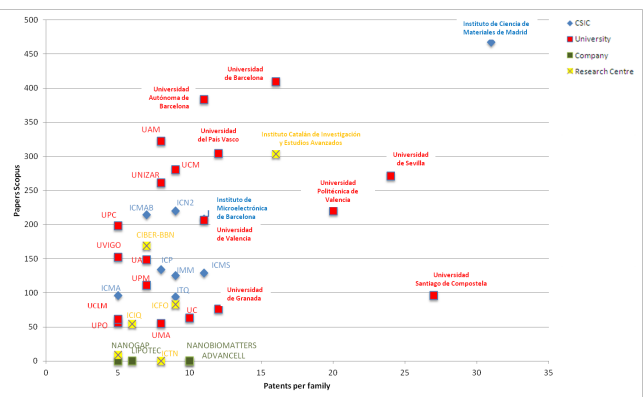
Top patenting institutions

The most inventive applicant was the CSIC research centre Instituto de Ciencia de Materiales de Madrid (ICMM), followed by the *Universidad de Santiago de Compostela* and the *Universidad de Sevilla*. Their inventive strength is an important factor why their correspondent Spanish regions are amongst the top.



Patent output vs. scientific paper output

It was of interest to compare the patenting and scientific publishing behaviour in order to see some kind of correlation. The top applicants, the Spanish universities of Santiago de Compostela (USC) and Sevilla (US) in the right side, followed with some distance from the Universidad Politecnica de Valencia (UPV). Although the USC has the highest patent output, it has a moderate paper output comparing to the other universities (in red). The most productive entity in both, patent families and papers is the Instituto de Ciencia de Materiales de Madrid (ICMM). The most productive in paper publishing turned out to be the two universities of Barcelona (UB and UAB), although the latter have far less patents compared to the ICMM. Non university and CSIC research centres which we can point out is the *Institució Catalana de Recerca i Estudis Avançats (ICREA)* with a relatively high patent and paper output.



Acknowledgments

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References

- [1] Jürgens, B. (2016). *Nanotechnology in Spain: technology watch by patents* (Doctoral dissertation). University of Granada.
- [2] Jürgens, B.; Herrero-Solana, V. (2016). *Patentometric Study of Nanotechnology in Spain*. *NanoSpain 2016 Conference* (Logroño, Spain - March 15-18, 2016). Pp: 90-91.
- [3] Maghrebi, M. et al (2010). *A collective and abridged lexical query for delineation of nanotechnology publications*. *Scientometrics*, 86(1), 15-25.
- [4] Jürgens, B.; Herrero-Solana, V. (2015). *Espacenet, Patentscope and Depatsinet: A comparison approach*. *World Patent Information*. Vol. 42.