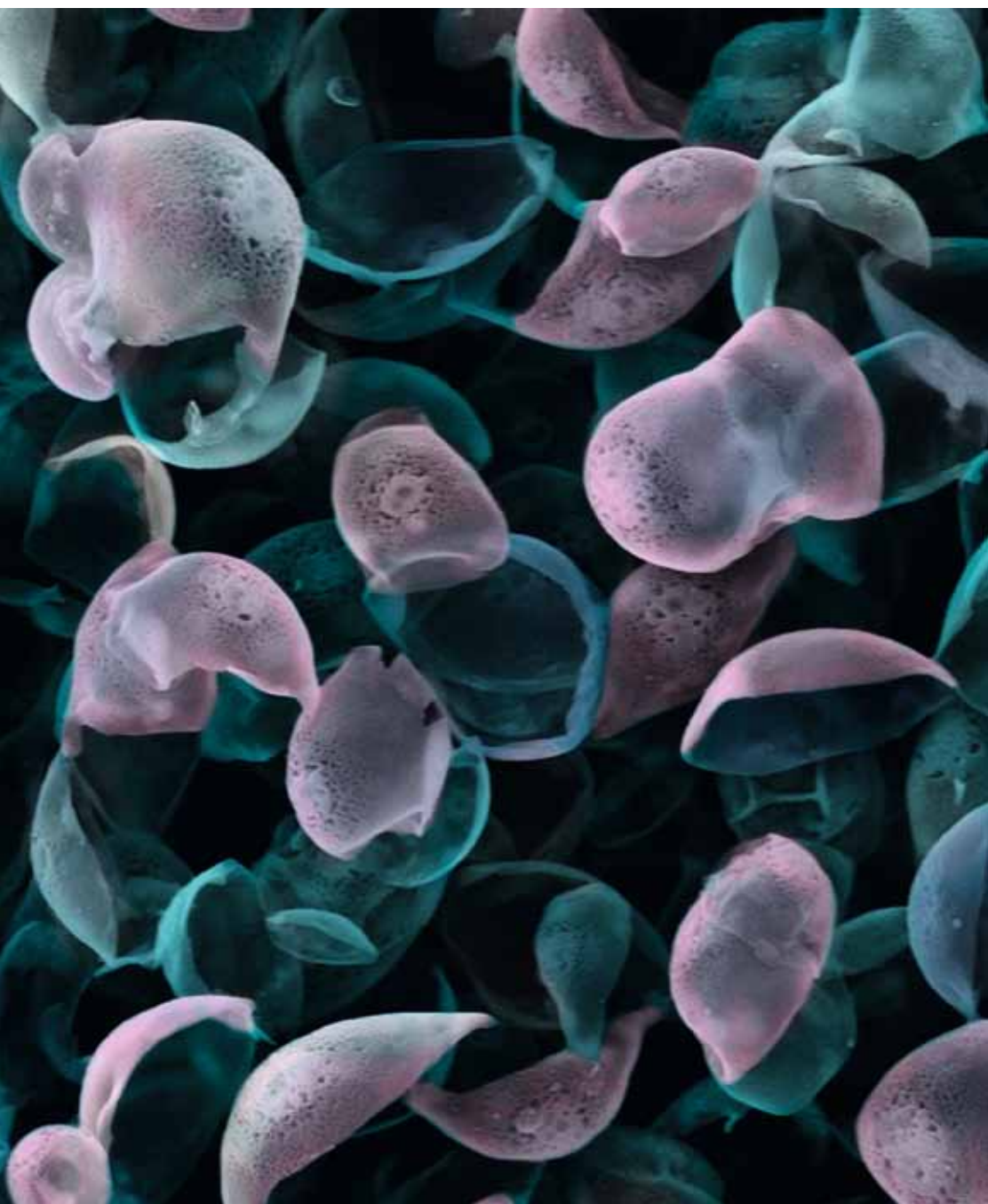




Europäisches  
Patentamt  
European  
Patent Office  
Office européen  
des brevets

# Nanotechnology and patents



Nanotechnology is a rapidly growing field and is set to be one of the key technologies of the 21st century.

The number of European applications filed for nanotechnology-related inventions has more than tripled since the mid-1990s.

The interdisciplinary nature of nanotechnology poses a challenge for patent offices, legal representatives, inventors and applicants alike.

This brochure explains how to get started if you want to search for nanotechnology inventions in patent databases, and what to look out for if you are thinking about applying to the European Patent Office for a nanotechnology patent yourself.

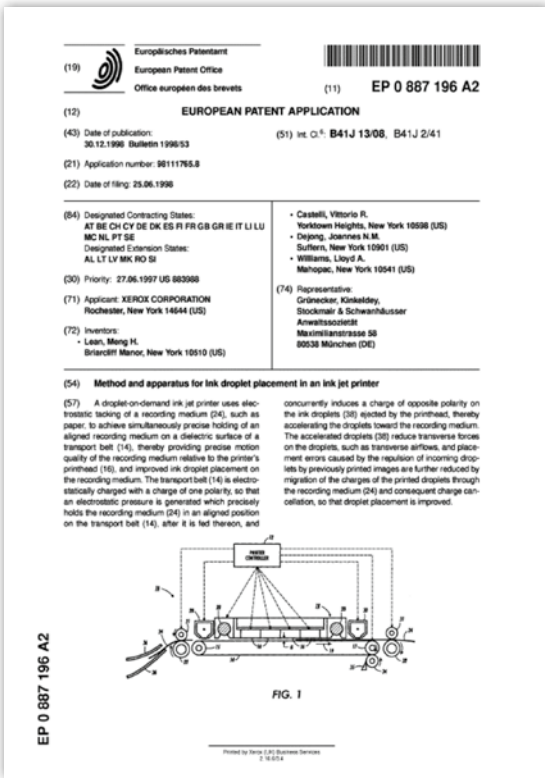
In order to monitor the impact of nanotechnology on the development of new products, the European Patent Office uses the following definition to identify patents in this area:

The term *nanotechnology* covers entities with a controlled geometrical size of at least one functional component below 100 nanometres (nm) in one or more dimensions susceptible of making physical, chemical or biological effects available which are intrinsic to that size.

# What is a patent?

A patent is a legal title which protects a technical invention for a limited period. It gives the owner the right to prevent others from exploiting the invention in the countries for which it has been granted.

When filing an application for a patent, applicants must disclose the details of how their invention functions. All patents are published, so everyone can benefit from the information they contain.



## Patent documents consist of

- a first page comprising basic information such as the title of the invention and the name of the inventor
- a detailed description of the invention indicating how it is constructed how it is used, and what benefits it brings compared with what already exists
- claims containing a clear and concise definition of what the patent legally protects
- drawings.

Patent documents describe technologies more precisely and in more detail than almost any other type of literature, so if you are faced with a technical problem, there is no better way of finding out what solutions already exist than by looking at patents.

# Searching nanotechnology patents for information

## Searching nanotechnology patent documents can help you to

- find out what already exists and build on it
- keep track of who's doing what
- avoid infringing other people's patent rights
- improve the quality of your patent applications.

## To make searching easier, every patent is classified.

The total number of patents is so large that a classification system is essential. Patent offices worldwide use the International Patent Classification (IPC).

**The Cooperative Patent Classification system (CPC)** is an extension of the IPC and is used by the European Patent Office and the US Patent and Trademark Office. Both the IPC and CPC are divided into eight sections, A-H, and these are further subdivided into classes, subclasses, groups and subgroups.

### The eight IPC and CPC sections

A	Human necessities
B	Performing operations; transporting
C	Chemistry; metallurgy
D	Textiles; paper
E	Fixed constructions
F	Mechanical engineering; lighting; heating; weapons; blasting engines or pumps
G	Physics
H	Electricity

# Classifying nanotechnology patents

Since the beginning of 2011, patent searchers have been able to use the “B82Y” sub-class to find documents relating to nanotechnology in the world’s patent databases. B82Y is a sub-class of the IPC and CPC. It is available for searching in Espacenet at [www.epo.org/espacenet](http://www.epo.org/espacenet) (see next page).

The B82Y nanotechnology sub-class is divided into nine main groups, eight of which relate to specific areas of nanotechnology. Using these for your searching limits the number of documents you have in your result lists when looking for a specific technical solution.

Code	Title
B82Y	NANOTECHNOLOGY
B82Y5/00	Nano-biotechnology or nano-medicine, e.g. protein engineering or drug delivery
B82Y10/00	Nano-technology for information processing, storage or transmission, e.g. quantum computing or single electron logic
B82Y15/00	Nano-technology for interacting, sensing or actuating, e.g. quantum dots as markers in protein assays or molecular motors
B82Y20/00	Nano-optics, e.g. quantum optics or photonic crystals
B82Y25/00	Nano-magnetism, e.g. magnetoimpedance, anisotropic magnetoresistance, giant magnetoresistance or tunneling magnetoresistance
B82Y30/00	Nano-technology for materials or surface science, e.g. nano-composites
B82Y35/00	Methods or apparatus for measurement or analysis of nano-structures
B82Y40/00	Manufacture or treatment of nano-structures
B82Y99/00	Subject matter not provided for in other groups of this sub-class

# Searching nanotechnology patents in Espacenet

You can use the **B82Y** sub-class codes to search for patent documents in the Espacenet database at [www.epo.org/espacenet](http://www.epo.org/espacenet).

Espacenet is a free internet patent database provided by the EPO. It contains more than 70 million patent documents from all over the world.

You can retrieve nanotechnology-related patent documents by entering the **B82Y** classification symbol in the **CPC** or **IPC** search fields in Espacenet's **Advanced Search**.

**Advanced search**

Select the collection you want to search in    
Worldwide - collection of published applications from 90+ countries

Enter your search terms - CTRL-ENTER expands the field you are in

Enter keywords in English

Title:  plastic and bicycle

Title or abstract:  hair

Enter numbers with or without country code

Publication number:  WO2008014520

Application number:  DE19971031696

Priority number:  WO1995US15925

Enter one or more dates or date ranges

Publication date:  yyyyymmdd

Enter name of one or more persons/organisations

Applicant(s):  Institut Pasteur

Inventor(s):  Smith

Enter one or more classification symbols

Cooperative Patent Classification (CPC):  B82Y

This will produce more than 100 000 results (at the time of publication of this brochure).

More than 100,000 results found in the Worldwide database for: **B82Y** as the Cooperative Patent Classification  
Only the first 500 results are displayed.

You can narrow down your search by combining the **B82Y** sub-class in the **CPC** or **IPC** search fields with other search terms, for example a keyword in the title or abstract field.

On the following page, we will show you an example of how to do this.

# Searching nanotechnology patents using classifications and keywords

Let's assume that you would like to find out what inventions exist for **DNA computers**.



Enter keywords in English

Title:

Title or abstract:

Enter numbers with or without country code

Publication number:

As is the case if you just enter **B82Y** in the CPC search field and nothing else, simply entering **DNA computer** in the keyword field will also produce a large number of hits, many of which are not even relevant because they relate to computing DNA sequences from sequencing data.

Approximately **728** results found in the Worldwide database for: **DNA computer** in the title or abstract  
Only the first **500** results are displayed.

You can filter out these "unwanted" hits by combining the **B82Y** class in the CPC search field with **DNA computer** in the title or abstract field. This new search produces **19** results (at the time of publication of this brochure):



Enter your search terms - CTRL-ENTER expands the field you are in

Enter keywords in English

Title:

Title or abstract:

Enter numbers with or without country code

Publication number:

Application number:

Priority number:

Enter one or more dates or date ranges

Publication date:

Enter name of one or more persons/organisations

Applicant(s):

Inventor(s):

Enter one or more classification symbols

Cooperative Patent Classification (CPC):



**19** results found in the Worldwide database for: **DNA computer** in the title or abstract AND **B82Y** as the Cooperative Patent Classification

# Searching nanotechnology patents using classifications and keywords

If you look at the eight nanotechnology codes, you will see that DNA computers fall under B82Y10, “Nanotechnology for information processing, storage and transmission”.

Combining this new code with the keywords DNA computer in Advanced Search...



Enter keywords in English

Title:

Title or abstract:

DNA computer

Enter numbers with or without country code

Publication number:

Application number:

Priority number:

Enter one or more dates or date ranges

Publication date:

Enter name of one or more persons/organisations

Applicant(s):

Inventor(s):

Enter one or more classification symbols

Cooperative Patent Classification (CPC):



...reduces the number of hits on the result list to 12:



Result list

42 results found in the worldwide database for:  
DNA computer (1: B82Y10) (IPC: B82Y10) for Cooperative Patent Classification

Title	IPC Class.	IPC Class.	IPC Class.	IPC Class.	IPC Class.	IPC Class.	IPC Class.	IPC Class.	IPC Class.
<b>1. A. INFORMATION ON A DNA COMPUTER</b>									
★ Inventor: UN (FR) 2004-0810 (20)	Applicant: UN (FR) 2004-0810 (20)	CPC: B82Y10/00	IPC: G06F09/00	Publication info: WO/2005/017780 (F)	Priority date: 2004-12-09				
<b>2. A. COMPUTER SYSTEM</b>									
★ Inventor: CHINESE ACAD OF SCI (CN) 01847044.2 (2004)	Applicant: CHINESE ACAD OF SCI (CN) 01847044.2 (2004)	CPC: B82Y10/00	IPC: H04B1/3796	Publication info: WO/2005/121493 (A)	Priority date: 2004-05-08				
<b>3. A. DNA COMPUTER FOR A QUANTUM COMPUTING SYSTEM</b>									
★ Inventor: BAHASA (JP) 20030284 (2003)	Applicant: FUJITSU LTD (JP)	CPC: B82Y10/00	IPC: G02F1/00	Publication info: JP2003121493 (A)	Priority date: 2003-03-09				
<b>4. A. QUANTUM COMPUTER, ITS MANUFACTURING METHOD, AND QUANTUM SUBSTRATE METHOD</b>									
★ Inventor: SHYKIN (RU) 20030004 (2003)	Applicant: FUJITSU LTD (JP)	CPC: B82Y10/00	IPC: G06F1/00	Publication info: JP20030004 (A)	Priority date: 2003-04-01				
<b>5. A. INFORMATION PROCESSING</b>									
★ Inventor: SA (EP) 0412 (2004)	Applicant: SA (EP) 0412 (2004)	CPC: B82Y10/00	IPC: G06F11/00	Publication info: EP0412 (A)	Priority date: 2003-03-27				
<b>6. A. Multiple input</b>									
★ Inventor: CA (US) 11967 (2001)	Applicant: SA (EP) 0412 (2004)	CPC: B82Y10/00	IPC: G06F11/00	Publication info: CA11967 (A)	Priority date: 2001-05-22				



Click on the document title to view the bibliographic data, including the CPC symbol (in this case B82Y10/00 and G06N3/123)...



...then click on the CPC symbols to find out what it covers:



If you now enter **G06N3/123** on its own in a new search in the CPC field of Espacenet's Advanced Search, you will get 236 hits (at the time of publication of this brochure) which, although they may not have the words **DNA** or **computer** in the title or abstract, all relate to DNA computers and computing.

Using the **B82Y** class in combination with keywords, as well as with other CPC codes, therefore improves the results you get from nanotechnology-related searches in Espacenet.

To find out more about how to use Espacenet, click on **Get assistance** on the left-hand side of the Espacenet screen and follow the Espacenet assistant.

# Legal requirements for nanotechnology patents

## Basic requirements for European patent applications

All European patent applications, including those relating to nanotechnology, have to meet the requirements of the European Patent Convention (EPC).

To get your nanotechnology patent granted:

- your invention must be new (the principle of "novelty")
- it must involve an inventive step, and
- it must be susceptible to industrial application.

Furthermore, the invention must be adequately disclosed and the claims of the application must be clear, concise and supported by the description.

### How do I find out if my invention is new?

When trying to determine whether or not your invention is new, it can be useful to look at catalogues and trade journals to see what is already on the market.

However, the single most important source of information for seeing what inventions already exist has to be the vast collection of published patent documents describing the relevant state of the art. A search of the patent literature using Espacenet will help to give you an indication of whether or not your invention is new.

## 1. Novelty and size

For an invention to be regarded as patentable it must be new, i. e. there must be no evidence that the same invention has ever been described before.

With regard to nanotechnology, the question is whether making a known device smaller is in itself novel. Generally speaking, this is not the case. Patent applications directed towards the downscaling of an entity have to meet additional criteria if they are to comply with the requirement of novelty.

A smaller version of a known device is considered new if it shows the same effect as the bigger one, but to a greater extent, such that it is reasonable to assume that the size was selected on purpose.

In general, if there is a technical effect that is enhanced in a selected sub-range, the device is new and not just a part of the prior art.

### Example

In nanotechnology, inventions are often defined by a parametric range. For example, particle A has a diameter in the range of 20-30 nm. What if a particle B of the same material is known and has a diameter of less than 1  $\mu\text{m}$ ?

At first sight, it seems that particle A is not new because the claimed range of 20-30 nm is already included in particle B's range of less than 1  $\mu\text{m}$ . However, A will be considered as new provided that the selected sub-range is

- narrow compared with the known range
- sufficiently far removed from any specific examples disclosed in the prior art and from the end points of the known range
- not an arbitrary miniaturisation of a known particle.

## 2. Inventive step

To be patentable, an invention must also be the product of an inventive step.

Novelty and inventive step are different criteria. Novelty basically exists if there is any difference between the invention and the known art. The question – "is there inventive step?" – only arises if there is novelty. The answer to this question is positive if a person who is skilled in the technical field of the invention and familiar with the prior art would not – on his own – have arrived at the solution provided by the invention.

When assessing whether or not a nanotechnology invention involves an inventive step, the key question is often whether the miniaturisation of a known device is inventive. Is it just a random selection, or is there a new technical advantage to be had from making it smaller?

If the inventor has simply taken the known prior art and made it smaller, without showing any particular technical advantage to making the invention this particular size, it is not inventive. In other words, there is no inventive step when the mere reduction of dimensions shows no additional or surprising effect and is arrived at arbitrarily.

However, if the invention provides a new technical advantage which was not to be found in the prior art, and it was not an obvious thing for a skilled person with a thorough knowledge of the state of the art to arrive at, then the miniaturisation could be considered inventive.

### Example

One of the features of an invention relating to a field-effect transistor was that it had an insulating layer with a thickness of 3–18 nm.

When assessing whether this feature involved an inventive step, it was decided that the thickness range for the dielectric film merely followed a trend towards miniaturisation in semiconductor devices.

The applicant also failed to demonstrate any particular effects produced by the film having this specific thickness. The thickness in this case was deemed to be an arbitrary selection, and the patent was not granted.

### 3. Disclosure

In many cases, nanotechnology is the product of highly sophisticated preparation methods and tools for manipulating materials in the nanometre or even molecular range. Some of these methods when applied to a highly specific problem go beyond the knowledge of the person of average skill in the field, and even beyond that of experts.

Sufficiency of disclosure, i. e. providing the skilled person with sufficient information as to how the invention is performed, is therefore a very important requirement for nanotechnology applications. The application as filed has to enable the skilled person to carry out the invention over the whole of the (broad) field claimed. To this end, the skilled person needs detailed information about the processes and tools used.

#### Example

It is not sufficient to say "nanoelectrodes with a diameter of 5 nm were deposited onto a substrate", since this cannot be done with commonly known methods. The precise conditions for carrying out the method have to be described.

#### Points to remember

Clarity can be a problem in nanotechnology applications, particularly if relative terms or unusual terminology are used. It is important to use terminology that has a well-recognised meaning or to word the application more precisely.

The application as a whole must disclose the invention in such a way that a person skilled in the art can carry it out.

Making something smaller does not automatically make it new or inventive. Miniaturisation-based inventions should always demonstrate an enhanced technical effect derived from the size.

# Further reading

## Online information

### **Inventors' handbook**

[www.epo.org/inventors-handbook](http://www.epo.org/inventors-handbook)

### **An introduction to European patents**

[www.epo.org/guide](http://www.epo.org/guide)

### **Filing applications online**

[www.epo.org/online-filing](http://www.epo.org/online-filing)

### **Board of appeal decisions**

[www.epo.org/appeals](http://www.epo.org/appeals)

### **Searching patent documents**

[www.epo.org/pi-tour](http://www.epo.org/pi-tour)

[www.epo.org/espacenet](http://www.epo.org/espacenet)

### **Guidelines for Examination in the EPO**

[www.epo.org/guidelines](http://www.epo.org/guidelines)

## Publications

All publications are available at: [www.epo.org/publications](http://www.epo.org/publications)

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Kaja Deing

*Scanning electron micrograph of a tris(8-hydroxyquinoline)aluminium layer*

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