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ATOMIC FINGER PRINTING TECH COULD END COUNTERFEIT GOODS

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ABSTRACT

Deciding whether a substance is steel, brick , wood or plastic is easy but it's not on the atomic scale, which lacks information about such everyday characteristics. Using an atomic force microscope (AFM), an international team of physicists has developed a method of atomic fingerprinting that can determine the chemical identity of individual atoms on a surface mixed with all of them.

I. INTRODUCTION

It has long been known that counterfeit goods have flooded practically almost every consumer market in the world, but scientists have now developed a stamping method, known as atomic fingerprinting, that one day might stamp them out for good.

Counterfeiting costs the global economy some $500 billion per year and is a problem that's vast in scale, but the new anti-counterfeiting method being developed at Cornell University has the potential to change everything.[1]

The method entails intentionally fabricating flaws into an atom-thin layer of material, such as graphene oxide, which is woven into an item such as a piece of clothing. For example, a carbon atom can be removed, or an oxygen atom can be added to create a unique pattern

II. THE APPLICATION OF ATOMIC FINGERPRINT TECHNOLOGY :

Customers will now be able to tell if the goods are authentic by scanning the label with their Smartphone cameras. The flash of the camera will excite the electrons in the product. The Smartphone will have an app which will analyze the image taken by the camera and read the patterns in the hologram thereby authenticating whether the label is authentic or not. The process is satisfactorily simple yet hard to copy.

In order to solve a huge issue like **counterfeiting goods**, a solution that can be adopted by a large number of manufacturers and customers had to be found. This is a technique that is easy to use on products and the apps will easily analyze the hologram and instantly tell customers whether the product is authentic.

The next step for these researchers is to use the technique in the pharmaceutical industry. Counterfeiting has been rife in this industry, with millions of fake drugs flooding the market every year. What is worse is that some of these counterfeit drugs end up causing death to patients.

Shocking statistics show that 30 percent of drugs sold in the world do not have the active ingredient. This means that patients who buy these drugs believing that they are the real deal end up not getting threatened for their ailments.

The research team is confident that very soon, the **atomic fingerprint** that they have developed may be laminated on each individual pill, allowing a patient to tell if the pill he or she is swallowing is actually going to heal them.

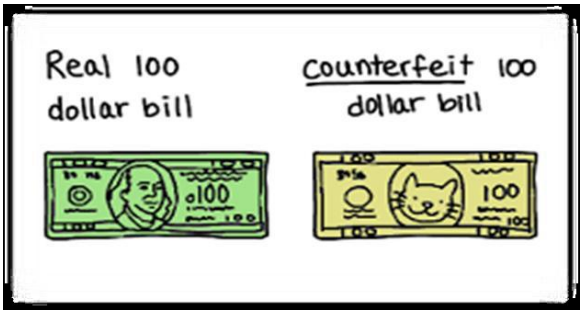
There is a lot of excitement as the potential of atomic fingerprinting becomes apparent to manufacturers of various goods and services.

III. NEED OF ATOMIC FINGERPRINT

The atomic fingerprint is needed to solve the issues like counterfeit goods, as "There is no bigger crime then counterfeit crime," said Robert Young, a professor of physics at Lancaster University in the United Kingdom and chief technology officer of the tech start-up Quantum Base. Here the question arises that what is the **counterfeit**

To **counterfeit** means to imitate something. Counterfeit products are fakes or unauthorized replicas of the real product

Counterfeit products are often produced with the intent to take advantage of the superior value of the imitated product



The word counterfeit frequently describes both the forgeries of currency and documents, as well as the imitations of items such as clothing, handbags, shoes, pharmaceuticals, aviation and automobile parts, watches, electronics (both parts and finished products), software, works of art, toys, and movies

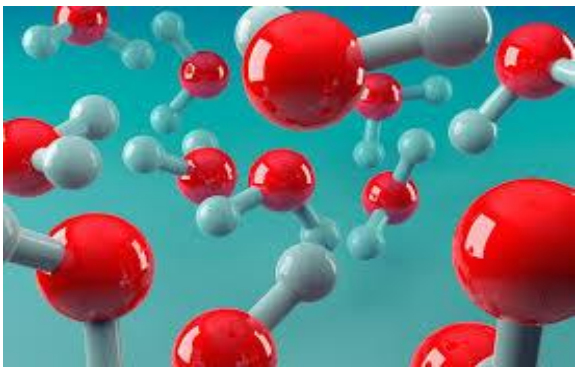
Counterfeit products tend to have fake company logos and brands (resulting in patent or trademark infringement in the case of goods), have a reputation for being lower quality (sometimes not working at all) and may even include toxic elements such as lead. This has resulted in the deaths of hundreds of thousands of people, due to automobile and aviation accidents, poisoning, or ceasing to take essential compounds (e.g., in the case a person takes non-working medicine).[3]

Now for this counterfeit crime an anti-counterfeiting method is used. This anti-counterfeiting method has two components –

- A unique molecular pattern that can be incorporated into a holographic label.
- Smartphone app.

IV. HOW A UNIQUE MOLECULAR PATTERN IS CREATED?

The unique pattern is created by intentionally fabricating flaws into an atom-thin layer of material, such as graphene oxide. Flaws may include removing a carbon atom, or adding extra oxygen atoms, or creating a ridge of atoms, according to the researchers. Once the flaw is set, the material is incorporated into an ink and then, using an inkjet printer, printed onto a hologram, which can be added as a label to any product



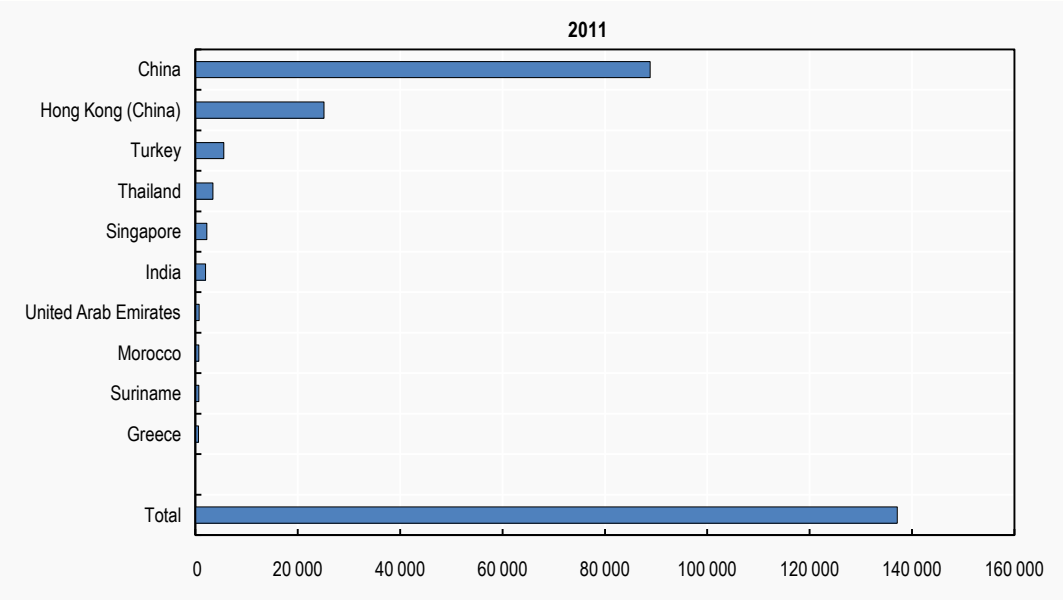
To confirm the presence of the atomic pattern, a person would use a Smartphone camera and its built-in flash to photograph the label. The flash excites the atoms, which produce a unique colour based on the pattern. A corresponding app can instantly analyze the image and confirm whether the label is authentic or not, the researchers said. [5]

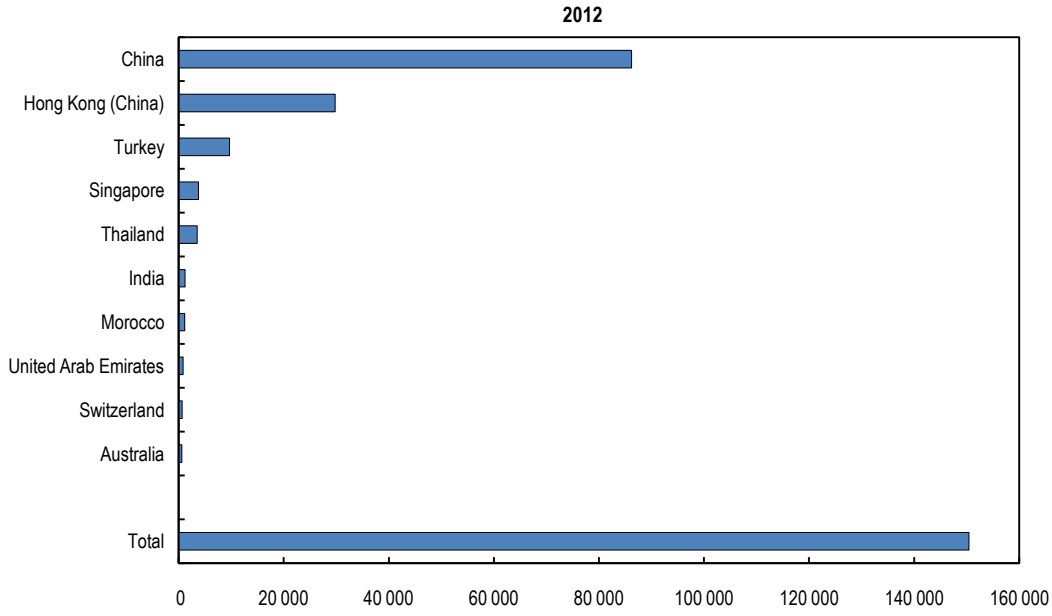
V. GLOBAL TRADE IN FAKE GOODS

According to Organization for Economic Cooperation and Development (OECD), In 18/04/2016 - Imports of counterfeit and pirated goods are worth nearly half a trillion dollars a year, or around 2.5% of global imports, with US, Italian and French brands the hardest hit and many of the proceeds going to organized crime, according to a new report by the OECD and the EU's Intellectual Property Office.

"Trade in Counterfeit and Pirated Goods: Mapping the Economic Impact" puts the value of imported fake goods worldwide at USD 461 billion in 2013, compared with total imports in world trade of USD 17.9 trillion. Up to 5% of goods imported into the European Union are fakes. Most originate in middle income or emerging countries, with China the top producer.

The report covers all physical counterfeit goods, which infringe trademarks, design rights or patents, and tangible pirated products, which breach copyright. It does not cover online piracy, which is a further drain on the formal economy.


2011
China
Hong Kong (China)
Turkey
Thailand
Singapore
India
United Arab Emirates
Morocco
Suriname
Greece
Total
0
20 000
40 000
60 000
80 000
100 000
120 000
140 000
160 000


2012
China
Hong Kong (China)
Turkey
Singapore
Thailand
India
Morocco
United Arab Emirates
Switzerland
Australia
Total
0
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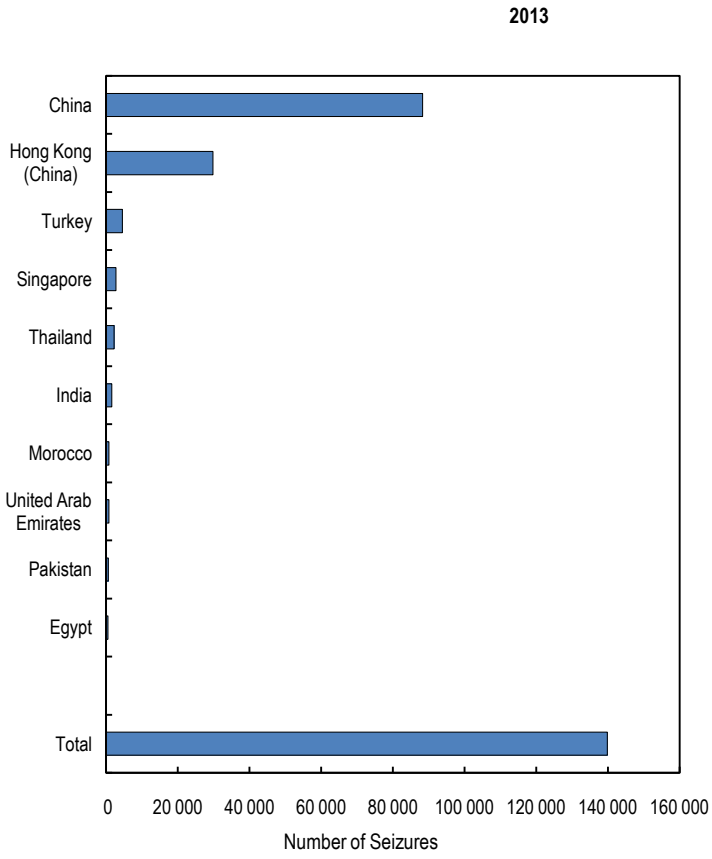


The report analyses nearly half a million customs seizures around the world over 2011-13 to produce the most rigorous estimate to date of the scale of counterfeit trade. It points to a larger volume than a 2008 OECD study which estimated fake goods accounted for up to 1.9% of global imports, though the 2008 study used more limited data and methodology.

Fake products crop up in everything from handbags and perfumes to machine parts and chemicals. Footwear is the most-copied item though trademarks are infringed even on strawberries and bananas. Counterfeiting also produces knockoffs that endanger lives – auto parts that fail, pharmaceuticals that make people sick, toys that harm children, baby formula that provides no nourishment and medical instruments that deliver false readings.

It notes that emerging economies tend to have the infrastructure for large-scale trade but often suffer from governance gaps and may lack the institutions and enforcement capacity to effectively tackle counterfeiting. While China is the top provenance of fake goods, it's most innovative companies also fall victim to counterfeiters.

The top countries whose companies had their intellectual property rights infringed in the 2011-13 seizures were the United States, whose brands or patents were affected by 20% of the knock-offs, then Italy with 15%, and France and Switzerland with 12% each. Japan and Germany stood at 8% each followed by the UK and Luxembourg.

Postal parcels are the top method of shipping bogus goods, accounting for 62% of seizures over 2011-13, reflecting the growing importance of online commerce in international trade. The traffic goes through complex routes via major trade hubs like Hong Kong and Singapore and free trade zones such as those in the United Arab Emirates. Other transit points include countries with weak governance and widespread organized crime such as Afghanistan and Syria. The report shows trade routes change greatly from year to year as counterfeit gangs' spot new weak points.

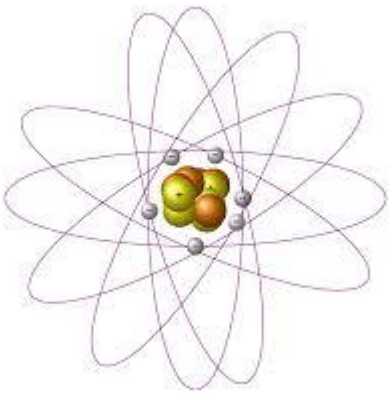
VI. WHAT TYPE OF GOODS IS HIT?

- Fake products crop up in everything from handbags and perfumes to machine parts and chemicals.
- Footwear is the most-copied item though trademarks are infringed even on strawberries and bananas.[4]

VII. ATOMIC FINGERPRINTING IS BASED ON BOHR MODEL OF ATOM

- In the Bohr model of the atom, electrons can be found only in certain energy levels. Electrons "jump" from one level to the next without passing through any of the regions in between. When an electron moves from one level to another, it gains or losses energy, depending on the direction of its jump. Bohr's model explained an unusual event. When electric current flows through a gaseous element, the gas produces a glowing light, like a neon sign

- If this light is passed through a prism, a pattern of lines appears, with each line having a different color. The pattern depends on the element- neon has one pattern and helium another. What causes these lines and why are they always the same for a given element? In Bohr's model, the lines are caused by electron jumps from higher to lower energy levels. Because only certain jumps are possible, electrons release energy only in certain quantities. These packets of energy produce the lines that are seen.



- Because the energy levels in each element are different, each element has a unique set of lines- a sort of atomic fingerprint. These lines can be used to identify known elements. This method is often used to identify gases in a mixture, and can be used to determine the chemical composition of stars and interstellar gases.[6]

VIII. CONCLUSION

Solving such an extensive problem like counterfeiting requires a solution that can be adopted by a large number of people, Young added. A technique that's easy to incorporate and easy to analyze could ensure that it's widely adopted much faster such as atomic fingerprinting

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