

An Environmentally-friendly Catalytic System to Synthesize Quinolines Using Nanotechnology

Patent Title: Solid Supported Gold Nano particles, methods of use thereof, and methods for making same
US Regular Patent Application No: 13/107,043
PCT Application No: PCT/CN2011/000835
Versitech Ref No: IP00356
Priority Date: May 14, 2010

The invention provides a new, efficient and environmentally-friendly method for the synthesis of quinolines from anilines and aldehydes by using solid-supported gold nanoparticles as the catalyst.

Market Opportunity

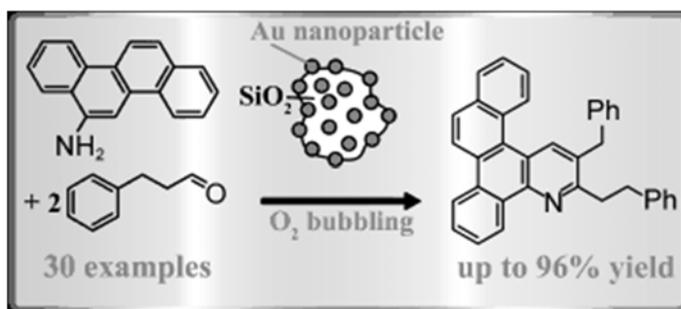
Quinolines are prevalent in natural product chemistry. They are the important building blocks in organic synthesis, drug discovery and materials science. According to the Trade Component of the Natural Features Programme, the global Natural Products industry was valued at between US\$40-60 billion annually in 2007. Organic Monitor estimated global organic sales to be \$50.9 billion in 2008, double the \$25 billion recorded in 2003. [1] Taking sales of natural & organic cosmetics as an example, Organic Monitor reported that they were soaring, with revenues approaching US\$7 billion in 2007[2].

The HKU Invention

Currently, most reactions for synthesizing quinolines involve strong acid, toxic chemicals (nitrobenzene and iodine) and high temperatures, which lead to low yields and damage the environment. Moreover, the homogeneous catalyst used to circumvent such problems is difficult to recover and recycle. To solve these problems, this HKU invention discloses a new use of solid-supported gold nanoparticles as an environmentally-friendly and recyclable catalyst for the synthesis of quinolines. Metal nanoparticles exhibit superior catalytic activities compared with currently used materials because of their high surface area and high density of active sites.

As shown by the invention, AuNPs/SiO₂ is rather effective for the synthesis of quinolines from anilines with aldehydes, for it can effectively catalyze the aerobic oxidation of anilines with aldehydes to quinolines with yields up to 96% (30 examples). Furthermore, the oxidant used for this reaction is oxygen, which is low-cost and eco-friendly.

In addition, AuNPs/SiO₂ can be easily recycled by centrifugation. The same system can also be used to synthesize nitrogen containing polyheterocyclic compounds.



The invention is compatible with various starting materials because of its mild reaction condition requirement. Moreover, the use of oxygen is very cheap and non-toxic, which avoids the high cost and damage to the environment caused by the current catalysts. The new catalyst can also be easily separated and recycled. The advantages of the invention make the process of synthesizing quinolines cost-effective, environmentally-friendly, safe and simple.

About the Lead Inventor

Professor C M Che studied Chemistry and completed his PhD at The University of Hong Kong (HKU) before starting his research work at the California Institute of Technology from 1980 to 1983. He returned to HKU in 1983 as a Lecturer in the Department of Chemistry and has since been devoted to teaching and research at the University. Professor Che is a world-renowned and influential chemist. His major research fields are inorganic and organometallic chemistry and photochemistry. He has undertaken pioneering studies on ruthenium-ligand multiple bonded complexes, metal-catalyzed organic reactions, functional phosphorescent materials, photochemistry, electron and atom transfer reactions, and bioinorganic chemistry. Professor Che's most famous work is ruthenium-ligand multiple bonded complexes and oxidation chemistry. His research in this area has been highly praised by world-renowned chemists, including Wolf Prize winner Professor Harry B. Gray of the California Institute of Technology, and Nobel Prize winner Professor H. Taube, Stanford University.

References

[1] <http://www.ota.com/organic/mt/business.html>

[2] <http://www.organicmonitor.com/r1709.htm>

About Versitech Limited and the University of Hong Kong

Versitech Limited is the technology transfer and commercial arm of the University of Hong Kong (HKU). Being the first and foremost university in Hong Kong, HKU is an institution with a long and distinguished academic heritage, in addition to an international reputation for forward-looking pioneering research. HKU is consistently ranked among the very best in Asia by QS and Times Higher Education.

Contact Us

Address: Room 405A, Cyberport 4, 100 Cyberport Road, Hong Kong

Tel: (852) 2299 0111 Fax: (852) 2299 0122

Email: info@versitech.hku.hk Web: <http://versitech.hku.hk>



VERSITECH LTD.
The University Technology Transfer Company