SOUTH KOREAN MATERIALS AND LIFE SCIENCE ENTITIES PROVIDE AN INNOVATION ROADMAP FOR TOMORROW'S ECONOMY

A **CAS** WHITEPAPER

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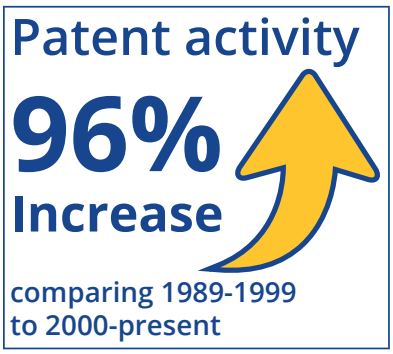
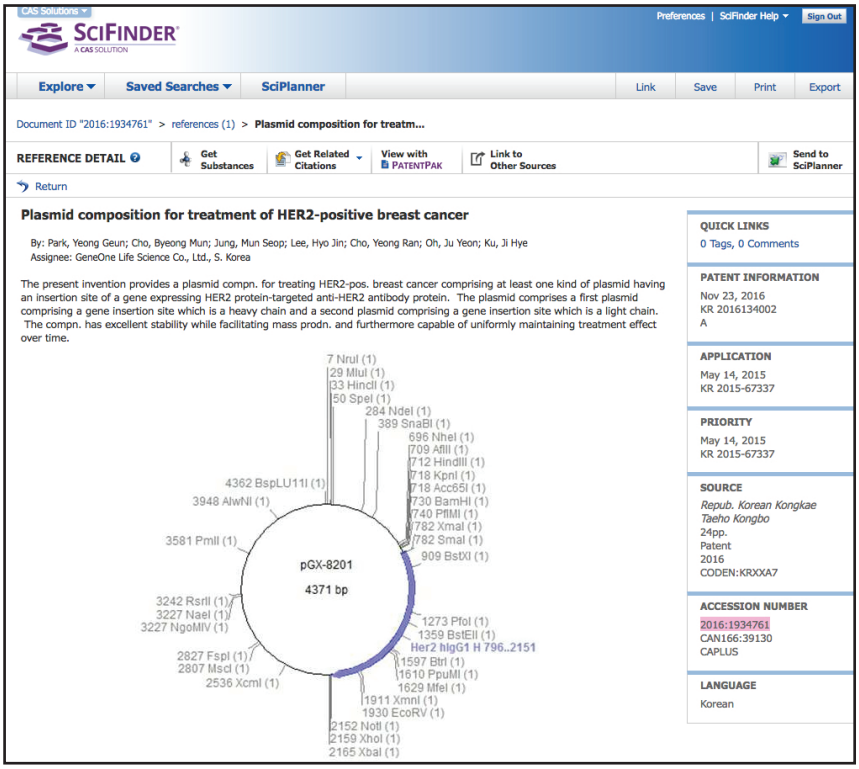
The South Korean economy has undergone tremendous change over the past several decades, particularly in the science, engineering, manufacturing and technology sectors. Government backing for science and innovation is solid, with one of the highest rates of R&D spending in the world, approximately 4.04% of GDP in 2015. New government initiatives are in place to propel innovation, such as the 2017 policy that will provide tax deductions for 30% of R&D costs for companies within 11 strategic industry segments. Despite the fact that scientific publishing rates in the country are lagging, patent activity is certainly on the rise. In fact, there has been a 96% increase in basic chemistry-related patents in South Korea from 2000 to present as compared to the previous ten year period (Source: CAplus℠ on STN®, April 2017).



South Korean patent activity has risen 96% since 2000 as compared to the preceding ten year period

Innovative South Korean Companies

South Korea is home to several pioneering groups that participate in the life science and materials science arenas. One example is GeneOne Life Science. Founded in 1976, the company began focusing on the development of DNA vaccines in 2005. In 2015, GeneOne received Investigational New Drug (IND) approval for two vaccines, one for MERS and one for Ebola. The next year, the company received two IND approvals for Zika vaccines. This innovative drive is further exemplified by the group's 2016 patent (KR2016134002A) entitled "Plasmid composition for treatment of HER2-positive breast cancer", which claims a DNA plasmid construct that includes a gene expressing an anti-HER2 antibody protein.



GeneOne's 2016 patent KR2016134002A

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BioSpectrum, started in April 2000 and currently located in Gunpo City, provides naturally-derived products for consumers of specialty skin cosmetics. One of their products is IsoNari™, a skin cream made from Japanese parsley and Chinese celery that has anti-adipogenic properties. BioSpectrum is the assignee for 77 domestic patents and 17 pending patents. A 2013 patent authored by the organization (WO2013/070030) discloses an anti-microbial, anti-inflammatory component that has naturally-sourced 3-dodecanoyloxy-2-isobutyryloxy-4-methylpentanoic acid as an active ingredient.

South Korean scientists are active not only in the applied sciences of vaccines and consumer products, but they also work on novel ways to augment basic chemical synthesis pathways. The work of Professor Sukbok Chang of KAIST is a case in point. Dr. Chang's recent publication entitled "Transition metal-catalyzed C-H amination: scope, mechanism, and applications" (*Chemical Reviews*, DOI: 10.1021/acs.chemrev.6b00644) discusses the use of transition metal catalysts to initiate amination reactions. These types of reactions are often used to manufacture naturally-occurring compounds, pharmaceuticals and other practical materials. Using these unique synthesis strategies, Dr. Chang's group can convert poorly functional chemicals into versatile alternatives.

Conclusions

The many basic and applied science organizations in South Korea are a collective power for growth and innovation in the country. South Korean researchers still have progress left to make when it comes to scientific publishing and the commercialization of home grown discoveries. Still, the nation's emphasis on STEM education and long-term investments in R&D will allow the economy to evolve from a handful of high-performing entities into a multitude of successful enterprises across a variety of sectors.

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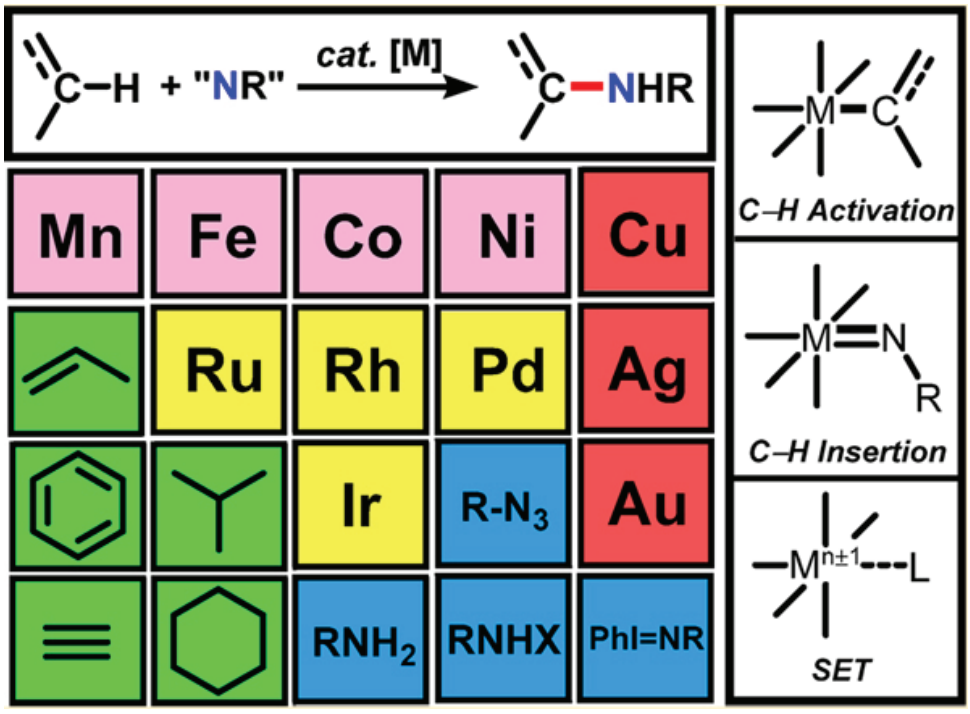

Figure from Park, Kim and Chang (2017) Chemical Reviews. http://pubs.acs.org/doi/pdf/10.1021/acs.chemrev.6b00644

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