

## COMMERCIAL CHEMISTRY: PAST PRESENT AND THE FUTURE

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### ABSTRACT

*Chemistry is a common man's science which we use in our day to day life and it goes back to the ancient ages with preservation of mummies in Egypt, alcohol brewing, Glass making, and metallurgy in making alloys for utensils, coins and weapons. It amazes us that whatever walk of life we choose, we find chemistry in that. It is known as the Central Science. The idea of atom, positive and negative energies, elements, matter dates back to 400-1000 BC.*

**KEYWORDS:** Commercial Chemistry, Alcohol Brewing, Glass Making, Metallurgy.

### Introduction

#### A Brief History

Let's look through some advancement in chemistry from historical point of view. Robert Boyle (1627-1691) gave an early understanding of atomic theory, studied the behavior of gases and gas volume's inverse relationship with pressure. Joseph Priestley (1733-1804) showed that air was a combination of gases. He discovered oxygen and seven other gases. At the same time Joseph Proust stated the law of Definite Proportion- a chemical compound will always have the same elemental proportion just like water H<sub>2</sub>O two is to one ratio of hydrogen to oxygen . Antoine Lavoisier (1743-1794) discovered metric system to ensure uniformity in weights and measures and found the Law of Conservation of Mass. Amedeo Avogadro (1776-1856) explained the difference between atoms and molecules and Avogadro's constant came into picture  $6.023 \times 10^{23}$  used to determine the mass of reactants and products in chemical reactions . John Dalton (1766-1844) stated the first atomic theory of matter that elements are composed of extremely small particles called atoms, which of the same element are of same size, mass and atoms of different elements combine to form compounds. Dmitri Mendeleev (1834-1907) developed Periodic Table of elements with 63 elements.

Major advancement came to the field of chemistry with Industrial Revolution of 19 century. During the First World War Universities tied up with companies and were provided with funds and raw materials to give new researches and chemicals to mass produce. Most important of the chemical studies was on extraction and distillation of oil and its usage as lubricants, heavy oils, refined oils, paraffin wax, petroleum for internal combustion used in majority of the industries world-wide. Discovery of artificial color purple by an English chemist called Perkin, used by royalties, lead to the discovery and mass production of synthetic dyes. Once considered as a wonder drug Aspirin as we know today was a remarkable invention which revolutionized the drug industry. Charles Good year, invented rubber, which found its use in daily life and in industries. Our technical knowledge today is based on the true work done during the Industrial revolution.

#### Industrial Revolution (Phase I)

Chemistry had a pivotal role in the First phase of the industrial revolution (1760 to 1830). Chemical manufacturing was one of the pillars of industrial revolution, be it the setting of textile industries or the iron forging. A major change that was brought about was replacement of wood with coke. This was a tsunami

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shift in metallurgy. Also the large scale production of chemicals got the ball rolling for what was to come in the future times. The production of sulphuric acid by the lead chamber process invented by the Englishman John Roebuck in 1746 was the one of the first. It was followed by production of an alkali on a large scale using the Leblanc process, named after Nicolas Leblanc, who in 1791 introduced a method for the production of sodium carbonate. The above two mentioned chemicals were very vital as they proved to be the building blocks of other inventions, replacing many small-scale operations with more cost-effective and controllable processes. This was followed by the discovery / development of the bleaching power which snow balled the textile industry reducing the original month long time required for the process to mere days. Scottish chemist Charles Tennant, man responsible for the development of the formula came to reckoning as the owner of the largest chemical plant of the world that existed at that time.

This was just the beginning as then the construction industry witnessed one of the important patents of the Portland cement in the year 1824. This was not all, other allied domains or industries such as glass and paper were making advances in leaps and bounds with new processes being devised and patents being registered. Looking at the topography of all these developments, although it was rooted to the United Kingdom but they were spreading to other countries like Belgium, France etc. In Europe and to other countries and continents also (e.g. Japan in Asia and United States of America in the North America).

### **Industrial Revolution (Phase II)**

Moving on to the second phase of the industrial revolution, the story was not different from what we witnessed in the first phase. The only changes were in the industries which were being impacted and the pace of the development. It won't be incorrect to quote that only thing constant in chemistry was change, rather rapid change. The 19th and 20th century witnessed these ground breaking developments in the chemical industry which proved to be building blocks of the infrastructure and economy of the modern day.

The coal in the first phase of industrial revolution was slowly replaced by the petroleum based products, however the iron forging took a back seat to the shining steel. Core chemical industry was marked by the invention of synthetic dyes. An English chemist, William Henry Perkin, discovered synthetic dye in 1856. Although the process still was in naïve stages and there was a major challenge that the British chemical industry faced from the exponentially advancing German Chemical industry. It would be wrong to miss out on the developments made in the rubber industry and not crediting the chemical compound of Sulphur to revolutionize the production of rubber tyres. The vulcanization of rubber, by American Charles Goodyear and Englishman Thomas Hancock in the middle of 19th century is still driving us to the places we want to go. Steel, rubber and petroleum combined accentuated and accelerated another sector of automobiles.

Applied sciences also boomed during this period. There are major advances when it came to an understanding of the molecular structures of various metals and their extensive properties which could be harnessed to make major technological leaps. The processes of refinement of metals were improved upon and many other alloys were discovered too. The study of thermodynamics saw a major turnaround and the findings of the same were used in other hard sciences as well as engineering disciplines. The contribution of chemistry to agriculture could not be denied. It was the ammonia that was used as the first inorganic fertilizer for plants' nutrition, all thanks to Mr. Justus von Liebig who discovered it and laid emphasis on the same. It was just the beginning and even in the modern era the importance of this science is still relevant.

### **The Modern Era:**

The pharma industry is the amplifier for the commercial aspect of the chemical industry. Innovations and continuous improvement in Pharma industry has made life saving drugs more affordable, number of chemical laboratories are being set up across the world to find solutions for endemic and epidemic diseases. Advanced researches like bio-engineering, mutation, artificial human organ production and genetic-reengineering are made possible, only with the help of the proper chemical industries across the world. It is very important to understand the importance of the chemical industry which has touched all our facets of life like Agriculture, Environment, Food, Hygiene, Décor, and Transportation etc. It has also significantly been used in re-cycling industries to curb the usage of virgin products. Re-cycling helps a lot in utilizing the waste materials, and gives one more life-cycle for the products. Chemicals play a major role in our food. The preservatives, taste enhancers and flavors help the food to be palatable and increase the shelf life. Fertilizers, and pesticides aid in the agriculture and development. Toiletries like soaps, scents, and perfumes are personal products that we use every day

### Instances of Vitality

Let's go through the 5 groundbreaking inventions that chemistry offered to this world. Penicillin the antibiotic which has saved our life from sore throat and cold was discovered by Alexander Fleming, but its commercial use was flared by Howard Florey during World War-II. Now, where do we get the most nitrogen from? We get it from the Haber Bosch Process. As we all know Nitrogen plays a vital role in the biochemistry of every living being. Haber and Bosch converted atmospheric Nitrogen and hydrogen into ammonia, used as a crop fertilizer, which ultimately enters our food chain. Polythene was accidentally discovered as a residual product of a chemical reaction, it was only known to have long molecular chains with no use, later was reacted with Oxygen to be commercially used and now called as Polythene. First Contraceptive Pill was made using root vegetable Mexican Yam compound that is converted into progesterone by organic chemistry professor Russel Marker, who discovered a manmade path to produce progesterone. LCD Liquid crystal display was used by British Ministry of defense in 1960's, but it only used to work at high temperatures. Then in 1970 George Gray invented a molecule 5CB that made LCD work on normal temperatures. So that's how we got our current flat screens.

### Conclusion

It is evident that human race cannot do without this stream of science. The moment we open our eyes in the morning till the time we retire to bed at night we are surrounded by its miracles in the form of inventions. The vitality of this science has touched its zenith with the everyday discoveries being made in the field. It has given hope to a better future that our children and grand-children are to witness. It would be incorrect to claim that this boon has its banes too. The environment, various viruses and the weaponry being developed are a few examples. However, it is up-to our conscious efforts that we make the judicious use of this repository of knowledge mined and collated over the years.

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