

It's a Myth than "Green" Chemistry Costs More



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What is "green" chemistry?

"Green" chemistry is about the development of new chemical processes that have reduced environmental impact and reduced hazard associated with them. In short, it is about making sure that in any type of chemistry on a large or a small scale there is reduced risk of an accident or harmful chemicals entering the environment. If "green" chemistry methods are used, ultimately it will mean that we no longer pollute the environment and can use less energy. Often in this field – also known as sustainable chemistry – we have to balance several factors and it is very difficult to make something 100% environmentally friendly, but it is something we can aim for and along the way we often make very exciting and economically viable discoveries.

What governments do in order to promote the development of new "green" solutions in the given sphere?

"Green" chemistry is all about partnerships and collaborations as it covers many different types of chemistry and chemical engineering. So, it is really important that all countries and both public and private bodies are involved in its development. I have been a professor in the U.K. and I am now based in Canada. I have also reviewed proposals for the French national research agency and the National Science Foundation (NSF) in the U.S. All of these governments have highlighted "green" chemistry, sustainability and energy as areas they want to support through their programs.

How is "green" chemistry R&D incorporated into national innovation systems in general?

As I mentioned earlier, the federal government of Canada has set up centers of excellence for commercialization and research (CECR). These are little bit different from normal centers of excellence that focus on research and discoveries being made by a team of world-class researchers. The publically funded CECR program focuses on bringing the innovations of Canada's world-class researchers – particularly those in academia but assistance is also given to

researchers in start-up companies – to the marketplace more quickly and in addition to "green" chemistry, centers focused on a wide range of research areas have been established. They are all about innovation and making that jump from the lab bench to the marketplace.

The government of Canada recognized that discoveries in "green" chemistry could make a huge impact on the future economy of Canada and provided funding towards the establishment of GreenCentre Canada.

Also, in Canada, there has been a lot of effort made to encourage researchers in Academia and Industry to come together and collaborate and to tackle big problems. Clearly, the development of safe, economically viable and environmentally friendly technologies is one of these big problems, as populations and standards of living are increasing around the world and putting increasing strain on the planet and the sustainability of humankind. Through industrial collaborations with university researchers, undergraduate students, postgraduate students and more established researchers (those already holding a PhD degree) get valuable real-world exposure and industry gets access to new ideas and innovations. In these situations, everyone wins, and with "green" chemistry the planet wins too.

Do "green" chemistry technologies increase the costs significantly? If so, why would the industry develop "green" chemistry?

There is a myth surrounding "green" chemistry that it costs more. In many cases, it just isn't true at all. "Green" chemistry researchers are very aware of the triple bottom line while they are performing their research. That is it must benefit the environment, society and the economy. Although some of our discoveries turn out not to be suitable for commercial development, we can learn from this and develop new ideas from that starting point. In many cases, there are extra benefits to going "green". For example, using supercritical carbon dioxide to extract high value flavor and aroma molecules from plants means that the residue (waste material) can then be fed to animals (livestock). If hexane, a common organic solvent, is used in the extraction process the residue of the plant is now toxic and has to be incinerated – this would end up being a more costly process in addition to being less "green".

Are there any governmental "green" standards that regulate production and therefore promote "green" chemistry development?

In most countries there is growing legislation concerning chemical processes and pollution. Probably the most well known at the present time are global efforts to reduce greenhouse gas emissions. This means that both governments and industry are very keen to develop innovative processes with a low carbon footprint. This can be done in many ways. One way is to use biomass as a feedstock and this is likely one reason why the government of Canada recently invested in research efforts within the forestry sector. Added benefits to this investment would be the creation of sustainable employment in rural settings and management of the Canadian forest landscape.