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Understanding the kinetics and mechanisms of reaction of radicals has been a focus of my research for many years now. The applications of this research are extremely widespread, but at present two of our major projects are:

1) The removal of dangerous chemicals from drinking water. This area of research has been investigating the use of oxidizing hydroxyl radicals (•OH) and reducing hydrated electrons (e-aq) to destroy unwanted chemicals in drinking water. The goal of this work is to identify the classes of chemicals that can be readily treated using these radicals, and then optimizing the conditions for this chemistry. Currently our investigations are focused upon the removal of different classes of carcinogens, pharmaceuticals, pesticides/herbicides and their residues, as well as by-product chemicals formed in the water purification processes.

2) Understanding the mechanisms of carcinogenesis. The major focus for us in this area is the chemical class of nitrosamines (R1R2N-NO) which have been proven to be carcinogenic, mutagenic and teratogenic. Nitrosamines are everywhere in our world, found in many food and beverage products, especially after fermentation or cooking, and notably in cigarette smoke. However, the radical-based action of these chemicals, especially under biological conditions, has not been well characterized. Presently, we are studying the formation and subsequent reactions of nitrosamine radical species, especially with the biologically significant superoxide and carbonate radicals.

Education

Ph.D., Chemistry, University of Melbourne, Australia, 1990
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