

Some Significant Chemical Researches in the Past Decade

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Abstract

Many chemistry researches made during the 1990s had a significant impact. Researches such as gas-phase ion chemistry, had a major impact in the academic arena, leading to substantial changes in chemistry ideas and views; while researches on molecular shapes promoted the understanding of drugs; and yet others such as the breathalyzer used to detect drunken drivers, had important social implications. This paper attempts to list and summarize some of those researches.

Keywords: Stoichiometry, gas-phase ion, microcalorimetry, molecular shape, solid state acids, nitrogen fixation, superconductors, supercritical fluid extraction, solubility equilibria, nuclear medicine, thermodynamics.

Introduction

Many significant chemistry researches were made during the past decade, the 1990s. Some researches such as gas-phase ion chemistry, had a major impact in the academic arena, leading to substantial changes in chemistry ideas and views; while some, such as researches on molecular shapes, promoted the understanding of drugs; and yet others such as the breathalyzer used to detect drunken drivers, had important social implications.

This paper attempts to list and summarize some of those researches. Due to the limited access to the chemical literature, this list is by no means exhaustive and no pretence is made to be so.

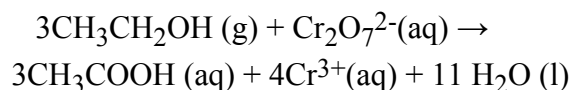
The Researches

Researches in various fields of chemistry are described below, not necessarily in chronicle sequence or order of significance, but at random.

The Stoichiometry of the Breathalyzer

The breathalyzer is used to determine if an individual is DUI (driving under the influence) or DWI (driving while intoxicated).

The chemistry of the breathalyzer (Bodner and Pardue 1995) is as follows:



The instrument consists of two ampoules each holding 0.75 g of potassium dichromate dissolved in 3 ml of 9 M sulfuric acid. One ampoule is used as a reference, while the other is opened and breath is added. If alcohol is present the orange dichromate ion $\text{Cr}_2\text{O}_7^{2-}(\text{aq})$ is reduced to the green chromium three ion $\text{Cr}^{3+}(\text{aq})$. The extent of green color developed as compared to the reference ampoule gives the amount of alcohol in the breath.

The breath alcohol contents are then converted into alcohol content in blood. The assumption here is that 2100 ml of exhaled air contains an equal amount of alcohol as 1 ml of blood.

Breathalyzer measurements are given as percent blood alcohol concentration (BAC) from 0 to 0.40%. The commonly set limit for DWI conviction in most countries is a BAC of 0.10% that corresponds to a BAC of 0.10 g alcohol per 100 ml of blood.

The importance of blood alcohol measurements was reflected by the 50 odd