'Slushie' Filtration: A Green Method for Limiting Waste Generation During the Microscale Synthesis of Analgesics

Muchalski, Olaf (School: Clovis West)

United Nations Sustainable Development Goals provide a shared blueprint for peace and prosperity for people and the planet. Goal 12: Responsible Consumption and Production is closely aligned with chemistry because manufacturing of goods from raw materials involves chemical transformations. Goal 12 calls for prevention of generation of hazardous wastes and acknowledges that addressing these challenges will require knowledge, experienced people, facilities, financial resources and technical and scientific capacities. Each year, thousands of students in universities around the world learn chemical synthesis by preparing crystalline compounds such as acetanilide, acetaminophen, acetylsalicylic acid, etc. Traditional synthesis experiments involve procedures that have not been optimized to minimize generation of hazardous waste. At the same time, the cost of disposal of laboratory waste is increasing rapidly and is one of the main reasons why laboratory instruction is very expensive. The goal of this project was to reduce the amount of waste generated during microscale synthesis by using an alternative method of filtration called ‘slushie’ filtration of pipette filtration. The efficiency of this procedure is demonstrated in the microscale preparation of analgesics. Comparative analysis of the two filtration methods showed that the new procedure reduced the amount of waste by nearly 50% and delivered more product. Melting point analysis, infrared spectroscopy (IR), and nuclear magnetic resonance (NMR) spectroscopy show that the purity of the product obtained with ‘slushie’ filtration is similar to the original method.

Awards Won: