



Journal of Applicable Chemistry

2014, 3 (4):1329-1336

(International Peer Reviewed Journal)



A Chemical Education Article-

Statistical comparison of results of redox titrations using $K_2Cr_2O_7$ and KIO_3 in the undergraduate analytical chemistry lab

David W. Randall^{1*} and Luis K. Garibay^{1,2}

1. Andrews University, Department of Chemistry & Biochemistry, 4270 Administration Drive, Berrien Springs, MI 49104 USA
2. Current address: Department of Chemistry, University of California, Davis, CA 95616 USA

Email: randalld@andrews.edu

Accepted on 12th July 2014

ABSTRACT

*Reducing the quantity of hazardous substances used and hazardous waste generated by undergraduate laboratory experiments is important. However, simply replacing hazardous compounds with less hazardous reagents may not retain the pedagogical (or analytical) goal of the experiment if the chemistry does not fundamentally work. We evaluated several literature-based replacement oxidants for $K_2Cr_2O_7$ (potassium dichromate) and identified KIO_3 (potassium iodate) as the only chemically viable alternative for thiosulfate standardizations, consistent with use of iodate by others. Using ANOVA analysis, two years of student results where $K_2Cr_2O_7$ was used as the oxidant were compared with two years of student results where KIO_3 was used as the oxidant (ANOVA p -value for precision = 0.684; ANOVA p -value for accuracy = 0.638). This **comparison** of multiple years of student data enabled us to confidently eliminate toxic Cr(VI) from a quantitative iodometric titration in our second year analytical chemistry laboratory, while students maintained a high level of both accuracy and precision.*

Keywords: Green Chemistry, Analytical Chemistry Education, Safety / Hazards, Titration / Volumetric Analysis.
