and nucleophilic sites attractively interact with them This behavior mirrors the well-established ability of unsaturated atoms to work as nucleophiles.

Experimental results have given forceful indications of the ability of Group 16-14 elements to work as electrophiles much earlier than the above-described model was developed. NMR techniques have afforded useful information, [5] but X-ray crystallography has been particularly effective in identifying the studied interactions. The solid-state structures of mono- and poly-cyanides of elements of Groups 16-14 give extensive and consistent examples of chalcogen, pnictogen, and tetrel bonds. Chalcogen bonds are present in the dicyanide of sulfur, selenium, and tellurium: any chalcogen atom forms two such interactions with two distinct cyano nitrogen atoms, and two-dimensional networks are formed (Figure 1). [6]

In $P(CN)_3$, all three cyano groups participate in short contact with phosphorous. Analogous interactions are present in all three $As(CH_3)_n(CN)_{3-n}$ (n = 0-2) derivatives. [7] $Tetrel(CH_3)_2(CN)_2$ (Tetrel = Si, Ge, Sn) show quite directional tetrel bonds (Figure 2) and a similar behavior is presented by trimethylcyano analogues. [8]

The project will be advertised in major symposia and conferences relevant to related fields (*e.g.*, the International Conference on the Chemistry of Selenium and Tellurium, the International Conference on Phosphorous Chemistry, and the International Symposium on Organic Chemistry of Sulfur). A kick-off meeting of the Project will be organized in Milan (Italy) early in 2017.

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www.iupac.org/project/2016-001-2-300

Standardization of Electrical Energy Per Order (E_{EO}) Reporting for UV/H_2O_2 Reactors

The Electrical Energy per Order (E_{EO}) is a useful concept for comparing the performance of ultraviolet-based (UV-based) advanced oxidation processes (AOPs) for the degradation of organic contaminants or other applications. The parameter was introduced in 2001 by Bolton, *et al.*, [1] in a report published by the IUPAC Photochemistry Commission. It is a fundamental concept and, if properly reported, it can be used to compare technologies based on reports and papers from various years, regardless of the energy costs in a given year.

However, researchers find that the usability of the E_{EO} values is undermined by incomplete reporting. The E_{EO} parameter depends on a variety of factors, from the concentration and the identity of the target contaminant to the amount of hydrogen peroxide added. Therefore, the E_{EO} parameter needs to be reported in AOP literature together with many other experimental details that affect the reactor performance for proper comparison between reactors across studies.

This project will identify the parameters that affect the E_{EO} outcome and need to be reported along with the E_{EO} values. The report will explain how to adjust the results of the different studies for comparison. Ways to standardize the reactor testing and results reporting will be proposed. The report will discuss the proper application of the E_{EO} parameter for bench-, pilot-, and full-scale studies. The proposed notation will also be reiterated.

The work builds on the prior IUPAC report by Bolton *et al.* (2001) that introduced E_{EO}. The goal of the report is further standardization for measuring and reporting E_{EO}. As such, it falls within the IUPAC mission of creating a standard communication protocol for experimental outcomes so that results can be widely used and shared.

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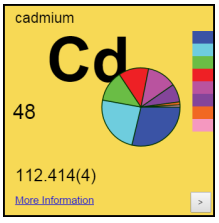
Isotopes Matter



How do we know what the temperature of our planet was a million years ago, in order to better understand climate change? Where did Őtzi the Iceman live as a child and an adult? What evidence gives doping agencies the gold standard to determine whether testosterone in an athlete's sample comes from doping? How do we obtain 3D images of tumors in soft tissues?

The answers to all of these questions and many more can be revealed through a deeper understanding of isotopes of the elements.

Isotopesmatter.com is a collection of new resources created for educators and students at secondary and post-secondary levels and to inform the public about the many uses of isotopes in our lives. They are based on educational practices that encourage engaged and active learning by students.

The interactive electronic periodic table and accompanying educational materials were created by a partnership between an IUPAC Project team of scientists and educators, and researchers at the King's Centre for Visualization in Science. They build on the work of a previous IUPAC project that produced a print version of the Periodic Table of the Isotopes.

"This project responds to requests by educators and students for resources that highlight the importance of isotopes in our lives and that give students help in using interval atomic weights for elements. The site www.ISOTOPESMATTER.com brings free, engaging, and interactive learning resources to the fingertips of students and educators around the world," says Task Group Co-Chair Peter Mahaffy, Professor of Chemistry at the King's University in Canada and co-director of the King's Centre for Visualization in Science.

Norman Holden, retired Research Coordinator of the High Flux Beam Reactor (HFBR) and the Brookhaven Medical Research Reactor (BMMR) and a Guest Scientist at the National Nuclear Data Center (NNDC) of Brookhaven National Laboratory in New York, adds: "It's great when scientists and educators work together to create a vehicle to provide students with an understanding of fundamental scientific facts and accomplish this internationally. "

Further details will be published in the peer-reviewed IUPAC Journal, *Pure and Applied Chemistry*.

For more information and comments, contact Task Group Chair Peter Mahaffy <peter.mahaffy@kingsu.ca> or Norman Holden <holden@bnl.gov>.
www.iupac.org/project/2014-024-1-200, or
www.iupac.org/isotopesmatter

Materials on the Nanoscale—Uniform Description System Version 2.0

A complete revised version of the Uniform Description System for Materials on the Nanoscale (UDS) is now available for download. Version 2.0 of the UDS is the result of two years of work and meetings by the CODATA-VAMAS Working Group on Nanomaterials that extensively updated and extended Version 1.0 (see *CI* July 2015, p.3 for a short description: http://dx.doi.org/10.1515/ci-2015-0402).

The UDS 2.0 contains 19 tables of detailed descriptors and their definitions that are directly applicable for reporting nanomaterials research results, identifying nanomaterials in regulations and standards, developing formats for nanoinformatics resources, specifying nanomaterials in commercial transactions, and other uses.

Comments and suggestions are welcome and can be sent to nanomaterials@codata.org

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