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depleted uranium



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[Effects of Organic Matter on the Specification of Uranium in Soil and Plant Matrices](#) Dec 2004 3 pages

Authors: [A. J. Bednar](#); [V. F. Medina](#); [S. L. Larson](#); [D. S. Ulmer-Scholle](#); [B. A. Frey](#); [J. G. Morgan](#); [ENGINEER RESEARCH AND DEVELOPMENT CENTER VICKSBURG MS](#)

Full Text

Radionuclides are known to complex with organic matter, which can promote mobility in soil environments. This work focuses on interactions of **depleted uranium** with organic compounds using HPLC-ICP-MS to identify organouranium species in soil and plant materials. Nearly all of the **uranium** extracted from certain plant tissues is bound to organic ligands. These experiments suggest organic compounds may be a significant influence on the chemistry of **uranium** in the environment.

[Uranium Enrichment: Analysis of Decontamination and Decommissioning Scenarios](#) Nov 1991 12 pages

Authors: [GENERAL ACCOUNTING OFFICE WASHINGTON DC RESOURCES COMMUNITY AND ECONOMIC DEVELOPMENT DIV](#)

Full Text

This section provides the detailed results of our analysis of whether a given stream of annual deposits made into a **uranium** enrichment cleanup fund would be sufficient to pay for expected future cleanup expenses. For the purposes of this analysis, total cleanup costs are divided into three types: (1) decontamination and decommissioning (D and D), (2) remedial action, and (3) **depleted uranium** costs. Cleanup cost estimates and the timing of those expenses were taken from several sources, with all sources presenting their estimates in 1992 dollars. D and ...

[Radiation- and Depleted Uranium-Induced Carcinogenesis Studies: Characterization of the Carcinogenic Process and Development of Medical Countermeasures](#) 2005 13 pages

Authors: [A. C. Miller](#); [D. Beltran](#); [R. Rivas](#); [M. Stewart](#); [R. J. Merlot](#); [P. B. Lison](#); [ARMED FORCES RADIOBIOLOGY RESEARCH INSTBETHESDA MD](#)

Full Text

... External radiation exposure could result from conventional military scenarios including nuclear weapons use and low-dose exposures during radiation accidents or terrorist attacks. Alternatively, internal radiation exposure could result from **depleted uranium** exposure via DU shrapnel wounds or inhalation. The long-term health effects of these types of radiation exposures are not well known. Furthermore, development of pharmacological countermeasures to low-dose ...

[Health Risk Assessment of Embedded Depleted Uranium: Behavior, Physiology, Histology and Biokinetic Modeling](#) Nov 1996 43 pages

Authors: [Terry C. Pellmar](#); [ARMED FORCES RADIOBIOLOGY RESEARCH INSTBETHESDA MD](#)

Full Text

This study evaluates the consequences of both short-term and long-term exposure to DU fragments in the rat model. Using an interdisciplinary approach, we are assessing neurotoxicity, nephro-toxicity, histopathology of the tissue surrounding the fragment and pathology including evaluation of neoplastic changes in several body tissues. In addition, based on our animal data, we will develop a biokinetic model that describes the distribution of **uranium** from embedded fragments as a function of time.

[Radiological Characterization Survey Report, 1964 B-58 Accident Site, Grissom Air Reserve Base, Bunker Hill, Indiana](#) May 2000 60 pages

Authors: [Steven E. Rademacher](#); [William V. Hoak](#); [INSTITUTE FOR ENVIRONMENT SAFETY AND OCCUPATIONAL HEALTH RISK ANALYSIS BROOKSAFB TX SURVEILLANCE DIRECTORAT](#)

Full Text

... exposure levels. Soil samples collected from the area indicated the presence of **depleted uranium**. This report details the historical site assessment, the results of the scoping surveys, and details of the comprehensive ... was accomplished in October 1999. The results of the survey confirm that a small area of the site investigated contains **depleted uranium** contamination. The investigation area was about 8,800 square meters and ... contamination zone is limited to an area of 1000 square meters, with a mean excess **uranium** activity concentration of 7 pCi/ g.

[The Military Deployment Human Exposure Assessment Study \(MDHEXAS\): Blood and Urine Exposure Biomarkers as Environmental Surveillance Tools for Assessing Military Personnel Exposure to Chemicals During Deployment to Camp McGovern, Bosnia](#) 2003 194 pages

Authors: [UNIFORMED SERVICES UNIV OF THE HEALTH SCIENCES BETHESDA MD](#)

... chemicals. Blood and urine exposure biomarkers for volatile organic compounds (VOC), selected heavy metals, **depleted uranium** (DU), and chemical warfare agents are currently available but have not been field tested or ... , and environmental and occupational monitoring methods were conducted for comparison to the exposure biomarker results. The urine **depleted uranium**, blood VOC, urine heavy metals, and blood ... ranges for the same compounds. The results of the study indicate that natural **uranium** and styrene environmental exposures increased during deployment. Therefore, ...

[Full Text](#)

[Computational Modeling of Dynamic Failure Mechanisms in Armor/Anti-Armor Materials](#) Feb 1991 89 pages

Authors: [Stephen P. Andrew](#); [Robert D. Caligiuri](#); [T. K. Parnell](#); [Lawrence E. Eiselstein](#); [FAILURE ANALYSIS ASSOCIATES INC MENLO PARK CA](#)

... in the armor/anti-armor research and development community, and database development was undertaken. A more limited project was also undertaken to assess and compare the effects of material properties and penetration mechanisms on the ballistic performance of **depleted uranium** and tungsten alloy penetrators. Material properties, ceramics, **depleted uranium**, dynamic failure modes, tungsten alloys, penetration mechanisms, ballistic performance.

[Full Text](#)

[Robust Algorithms for Penetration Mechanics Problems](#) Oct 1994 52 pages

Authors: [R. C. Batra](#); [MISSOURI UNIV-ROLLA](#)

... a thin shear layer, characterized by the sharp transition of the axial velocity of plate particles, develops. In an attempt to delineate the susceptibility of tungsten and **depleted uranium** penetrators to adiabatic shear banding, we have investigated the development of shear bands in a rectangular block of these materials deformed in plane strain ... orientations of shear bands are different in these two materials. The shear bands are found to initiate in tungsten at a lower value of the average strain than that in **depleted uranium**. (MM)

[Full Text](#)

[On the Aerodynamic Heating of a KE Penetrator - Conductive Material Heating and Thermal Gradients Prior to Transient Impact Loading](#) Sep 2001 30 pages

Authors: [Todd W. Bjerke](#); [ARMY RESEARCH LAB ABERDEEN PROVING GROUND MD](#)

... variables solution was used for the parabolic time-dependent conduction equation. The derived solution along with material properties for tungsten and **depleted uranium** were used to obtain the temperature increase profile through the radius of the penetrator as a function of flight time Both materials showed ... The tungsten penetrator exhibited nearly uniform heating across the radius, whereas heating of the **depleted uranium** penetrator was confined to the outermost region of the cylinder due to its low coefficient of thermal conductivity.

[Full Text](#)

[Effect of Solventless Bore Cleaning Device \(SBCD\) on Surface Finish and Contamination Transport in the M256 Gun Barrel](#) Sep 2006 14 pages

Authors: [Mark Bundy](#); [James Garner](#); [Gerald Garcia](#); [Robert Baylor](#); [Terry Marrs](#); [Julius Pitts](#); [Bob Vanina](#); [ARMY RESEARCH LAB ABERDEEN PROVING GROUND MD WEAPONS AND MATERIALS RESEARCH DIRECTORATE](#)

... , it addresses health and safety issues if the process is applied to barrels having fired **depleted uranium** rounds. As reported herein, the surface finish is unchanged by the cleaning process. Furthermore, a pre- and post-cleaned radiological survey of a contaminated ... no transport of radioactivity to the cleaning device components, or within the evacuated cleaning dust. The broader implications of the later test are that **depleted uranium** contamination, when present, lies within the barrel metal, which is not removed in the cleaning process.

[Full Text](#)

[Remedial Action Workplan, 1964 B-58 Accident Site, Grissom Air Reserve Base, Bunker Hill, Indiana](#) Aug 2000 36 pages

Authors: [Steven E. Rademacher](#); [INSTITUTE FOR ENVIRONMENTAL SAFETY AND OCCUPATIONAL HEALTH RISK ANALYSIS BROOKSAFB TX SURVEILLANCE DIRECTORAT](#)

... In 1999, AFIERA performed a radiological characterization of the site (IERA-SD-BR-TR-2000-0002). The results of the survey confirm that a small area of the site investigated contains **depleted uranium** contamination. The investigation area was about 8,800 square meters and had an estimated excess surface activity concentration of 1 pCi/g averaged over the ... the contamination zone is limited to an area of 1000 square meters, with a mean excess **uranium** activity concentration of 7 PCi/g. This report details a remedial action plan for the site. The ...

[Full Text](#)

["Hazard Classification Test of GAU-6 Ammunition by Bonfire Cookoff with Limited Air Sampling"](#) Feb 1976 11 pages

Authors: [J. C. Elder](#); [M. I. Tillery](#); [H. J. Ettinger](#); [LOS ALAMOS SCIENTIFIC LAB ALBUQUERQUE NM](#)

A standard hazard classification test of GAU-8 ammunition was performed August 26, 1975, for the U. S. Air Force Armament Laboratory (AFATL). Fragment pattern scoring following bonfire cookoff of 180 live rounds indicated only one shell base fragment was thrown beyond 400 feet by shell case disruption. **Uranium** aerosol dispersed by burning of **depleted uranium** penetrators within the ammunition was detected at five air samplers placed near the bonfire.

[Full Text](#)

[Hazard Classification Test of GAU-8 Ammunition by Bonfire Cookoff with Limited Air Sampling](#) Feb 1976 11 pages

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[Full Text](#)

[Structural Analysis of a Kinetic Energy Projectile During Launch](#)

Jul 1981 25 pages

Authors: [G. A. Pflegl](#); [J. H. Underwood](#); [G. P. O'Hara](#); [ARMY ARMAMENT RESEARCH AND DEVELOPMENT CENTER WATERVLIET NY LARGE CALIBER WEAPON SYSTEMS LAB](#)**Full Text**

... lug root. The value of maximum tensile stress in the root of the penetrator lugs was then used in a fracture mechanics analysis to determine a critical flow size which would cause brittle fracture. Using fracture toughness measurements from **depleted uranium** penetrator materials, critical flaw sizes were calculated and used to determine the likelihood of failure during launch and to formulate NDT inspection standards. (Author)

[Mold and Crucible Coatings](#)

Apr 28, 1986 83 pages

Authors: [Sylvia J. Canino](#); [Arthur L. Geary](#); [NUCLEAR METALS INC CONCORD MA](#)**Full Text**

... of the molds improved ingot surface quality, compared with zirconia coated or uncoated molds. Generally zirconium oxide washes outperformed titanium carbide under coated systems and yttrium oxide washes in the elevated temperature tests and in chemistry and ultrasonic results. Keywords: **Depleted Uranium** (DU); Ceramic Coatings; Graphite Coatings; MMT - Process improvement; Large caliber penetrators.

[Computational Model for Armor Penetration](#)

Oct 1987 218 pages

Authors: [D. C. Erlich](#); [L. Seaman](#); [D. R. Curran](#); [D. A. Shockey](#); [R. D. Caligiuri](#); [SRI INTERNATIONAL MENLO PARK CA](#)**Full Text**

... to develop a computational capability for predicting the behind-the- armor fragment environment for spaced armor attacked by long-rod penetrators. The baseline materials chosen were rolled homogenous steel armor (RHA) and **depleted uranium** (DU) for the penetrator. Phenomenological studies involving both quarter and full-scale ballistics tests at velocities up to 1.5 km/s and obliquities from 0 to 70 clearly revealed shear banding to be the ...

[Design and Analysis of Kinetic Energy Projectiles Using Finite Element Optimization](#)

Nov 1991 32 pages

Authors: [Brett R. Sorensen](#); [ARMY BALLISTIC RESEARCH LAB ABERDEEN PROVING GROUND MD](#)**Full Text**

This report discusses the minimization of the parasitic mass of a 120-mm cannon launched kinetic energy projectile. The purpose of this study was to design a minimum mass aluminum sabot to launch both **depleted uranium** and tungsten heavy alloy penetrator materials for the M829 penetrator geometry. The minimization was conducted by implementing finite element techniques. A parametric model of a kinetic energy projectile using a double ramp traction sabot was constructed ...

[Terminal Ballistics Test and Analysis Guidelines for the Penetration Mechanics Branch](#)

Jan 1992 131 pages

Authors: [John A. Zook](#); [Konrad Frank](#); [Graham F. Silsby](#); [ARMY BALLISTIC RESEARCH LAB ABERDEEN PROVING GROUND MD](#)**Full Text**

... scale penetrators are of simplified geometry compared with their full-scale counterparts. The penetrator is usually a monolithic right-circular-cylinder metal rod with a hemispheric nose made from either tungsten alloy (WA) or **depleted uranium** (DU). Terminal ballistics is that part of the science of ballistics that relates to the interaction between a projectile (penetrator) and a target. In general, the projectile is the package which flies through the air. ...

[The Development of a Tungsten Heavy Alloy That Fails by an Adiabatic Shear Mechanism. Phase 1](#)

Apr 1993 120 pages

Authors: [Sumit Guha](#); [Christos Kyriacou](#); [James C. Withers](#); [Raouf O. Loutfy](#); [MATERIALS AND ELECTROCHEMICAL RESEARCH CORP TUCSON AZ](#)**Full Text**

Kinetic Energy penetrators made from **Depleted Uranium** (DU) alloys have consistently performed better than equi-density and geometrically similar penetrators made from conventional tungsten heavy alloys (WHA) during ballistic penetration tests into semi-infinite Rolled Homogeneous Armor (RHA) steel targets. The superior penetration behavior of DU penetrators is presently attributed to these penetrators maintaining a 'chisel' nose by failure along adiabatic shear bands which is in contrast to the 'mushroom' head observed in WHA penetrators; the ' ...

[Army P/M Research and Development Overview](#)

May 1993 23 pages

Authors: [Robert J. Dowding](#); [Martin G. Wells](#); [Andrew Crowson](#); [ARMY RESEARCH LAB WATERTOWN MA](#)**Full Text**

... them iii the phalanx close-in weapon system (CIWS). The Army intends that research will lead to an alloy or composite of tungsten that, when used as a long rod penetrator, will perform as well as, or better than, current **depleted uranium** (DU) penetrators. This will allow possible replacement of the controversial DU. Powder injection molding of WHA is an area receiving attention because of the potential for producing small and medium caliber projectiles. The drawbacks at this ...

[Development and Characterization of Adiabatic Shear Prone Tungsten Heavy Alloys](#)

Jul 1993 81 pages

Authors: [Aniimesh Bose](#); [James Lankford Jr.](#); [Herve Couque](#); [WYMAN-GORDON CO WORCESTER MA](#)**Full Text**

Depleted uranium (DU) is currently the top-performing kinetic energy penetrator, followed closely (but not matched) by several tungsten heavy alloy variants. Because of the adverse environmental impact associated with DU, it is extremely desirable to determine a means of upgrading the ballistic performance of heavy alloys to a level at least comparable to that of DU. It is thought that the reason for the improved ballistic performance of DU-0.75 Ti alloy is embedded in its ability to self sharpen during armor penetration, and it is further postulated that this self-sharpening ability ...

[Geophysical Investigation at U.S. Army Materials Technology Laboratory, Massachusetts](#) Nov 1993 76 pages

Authors: [Jose L. Llopis](#); [Janet E. Simms](#); [ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG MS GEOTECHNICAL LAB](#)

Full Text

... 's first materials research reactor was completed at MTL, which was used actively in molecular and atomic structure research activities until 1970, when it was deactivated. In addition to the research reactor were facilities that stored and handled **depleted uranium** (DU). In 1989, the Commission on Base Realignment and Closure recommended that MTL be closed. The MTL closure program is being supervised by the U.S. Army Environmental Center. As part of the MTL closure ...

[A Ballistic Evaluation of Ti-6Al-4V versus Long Rod Penetrators](#) Jul 1996 58 pages

Authors: [Matthew S. Burkins](#); [Jack I. Paige](#); [Jeffrey S. Hansen](#); [ARMY RESEARCH LAB ABERDEEN PROVING GROUND MD](#)

Full Text

... calling for a lighter, nonmagnetic, noncorroding alternative for steel. However, before titanium could be considered for such applications, baseline ballistic performance information against modern tungsten alloy (WA) and **depleted uranium** (DU) alloy penetrators was required. A joint test program between the U.S. Army Research Laboratory, Aberdeen Proving Ground, MD, and the U.S. Bureau of Mines, Albany, OR, was conducted to determine this ...

[Nuclear Shipping and Storage Containers with Depleted Uranium \(DU\) shielding Department of Transportation \(DOT\) Certification Tests](#) Jan 1996 94 pages

Authors: [William R. Meyer](#); [ARMY DEFENSE AMMUNITION CENTER AND SCHOOL SAVANNA IL](#)

Full Text

The U.S. Army Defense Ammunition Center and School (USADACS), Validation Engineering Division (SIOAC-DEV), was tasked by Industrial Operations Command (IOC), AMSIO-SMA-N, to conduct Department of Transportation (DOT) tests on nuclear hazardous waste containers containing concrete and 30mm DU rounds for shielding. Two series of tests were conducted due to fluctuations in radiation levels experienced during the first series of tests. During the second series of tests no fluctuations in radiation were noted with only minor problems experienced with pressure leakage around the base of two of ...

[Gulf War Illnesses: Enhanced Monitoring of Clinical Progress and of Research Priorities Needed](#) Jun 24, 1997 14 pages

Authors: [GENERAL ACCOUNTING OFFICE WASHINGTON DC NATIONAL SECURITY AND INTERNATIONAL AFFAIRS DIV](#)

Full Text

... and protect it against chemical agents, fuel used as a sand suppressant in and around encampments, fuel oil used to burn human waste, fuel in shower water, leaded vehicle exhaust used to dry sleeping bags, **depleted uranium**, parasites, pesticides, drugs to protect against chemical warfare agents (such as pyridostigmine bromide), and smoke from oil-well fires. Moreover, DOD acknowledged in June 1996 that some veterans may have been exposed to the nerve agent sarin ...

[The Effect of Nose Shape on Depleted Uranium \(DU\) Long-Rod Penetrators](#) Sep 1997 66 pages

Authors: [Wendy Leonard](#); [ARMY RESEARCH LAB ABERDEEN PROVING GROUND MD](#)

Full Text

The ballistic performance of model scale U-3/4%Ti long-rod penetrators with three different nose-shape designs (blunt nose, conical nose, and frustum cone) were evaluated. The target matrix included semi-infinite rolled homogeneous armor (RHA) and two finite RHA targets, one at normal incidence and one at high obliquity, but with the same line-of-sight thickness. The results reflected the same trends as observed for a previous tungsten alloy penetrator study, demonstrating that the nose-shape effects are independent of penetrator material.

[The Performance and Deformation Behavior of Oriented Columnar-Grained Tungsten Polycrystalline Penetrators](#) May 1998 69 pages

Authors: [Lee S. Magness](#); [Wendy A. Leonard](#); [Deepak Kapoor](#); [Moon Chung](#); [Jeffrey Trogolo](#); [ARMY RESEARCH LAB ABERDEEN PROVING GROUND MD](#)

Full Text

... to be anisotropic. The penetration performances of the single-crystal penetrators were found to be a function of the crystallographic orientation of the penetrator axis. The performance of the 100-oriented tungsten penetrators was roughly equivalent to that of **depleted uranium** penetrators. In this series of ballistic experiments, the performance and deformation behaviors of polycrystalline tungsten penetrators having oriented columnar grains in 100, 110, or 111 directions were examined.

[Robust Algorithms for Penetration Mechanics Problems](#) Feb 1998 81 pages

Authors: [R. C. Batra](#); [VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG DEPT OF ENGINEERING SCIENCE AND MECHANICS](#)

Full Text

We have investigated the differences in the performance of identical **depleted uranium** (DU) and tungsten heavy alloy (WHA) rods when deformed in pure torsion, plane strain compression, and during impact at normal incidence onto a smooth rigid block or a deformable steel target. The thermomechanical response of the material has been modeled by the Johnson Cook relation that accounts for strain and strain rate hardening of the material and its thermal softening. The effect of modeling the thermal softening by a power ...

[Jefferson Proving Ground Site-Specific Technical Plan](#) Jan 1992 38 pages

Authors: [CHEM-NUCLEAR ENVIRONMENTAL SERVICES INC GRAND-JUNCTION CO](#)

Full Text

... via the surface water pathway. * Assess human health and environmental risk associated with this contamination. * Determine the presence or absence of contaminants in groundwater related to the Gate 19 Landfill and DU (**Depleted Uranium**) areas. * Confirm the results of previous investigations. Although there have been previous environmental investigations performed at JPG, little to no site characterization work has been

conducted and, therefore, data ...

[Galvanic Corrosion of Tungsten Coupled With Several Metals/Alloys](#)

Nov 1998 31 pages

Authors: [F. C. Chang](#); [J. H. Beatty](#); [M. J. Kane](#); [J. Beck](#); [ARMY RESEARCH LAB ABERDEEN PROVING GROUND MD](#)

Full Text

From an environment perspective, tungsten is a more desirable material than **depleted uranium** (DU) for penetrator applications. However, the ballistic performance attained by current tungsten (W) alloys is inferior to DU. Recently, advanced tungsten-metal (W-M) composites have been developed to improve their ballistic penetration, but the corrosion properties are unknown and need to be determined. In this work, the galvanic corrosion behavior of W coupled with several selected metals/alloys was investigated. ...

[Acquisition of a Computation/Visualization Server for the Center for Modeling and Simulation in Materials Science](#)

Apr 30, 1998 8 pages

Authors: [Diana Farkas](#); [VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG DEPT OF MATERIALS ENGINEERING](#)

Full Text

... structure, defects, phase evolution, and interfaces on material properties, (ii) the mechanical properties of polycrystalline and fiber composites including the stochastic geometry and constituent material properties, (iii) the failure mode transition in the dynamic fracture of steels and (iv) the penetration of **depleted uranium** and tungsten heavy alloys into steel targets.

[Remedial Action and Final Radiological Status, 1964 B-58 Accident Site, Grissom Air Reserve Base, Bunker Hill, Indiana](#)

Dec 2000 92 pages

Authors: [Steven E. Rademacher](#); [Brian Renaghan](#); [INSTITUTE FOR ENVIRONMENT SAFETY AND OCCUPATIONAL HEALTH RISK ANALYSIS BROOKSAFB TX SURVEILLANCE DIRECTORAT](#)

Full Text

... the Base Realignment and Closure Commission. In 1999, AFIERA performed a radiological characterization of the site IERA-SD-TR-2000-0002 (Available from NTIS). The results of the survey confirm that a small area of the investigation region contained **depleted uranium** (DU). AFIERA developed a remedial action plan for the site IERA-SD-TR-2000-OO 11 (Available from NTIS). The goal was to select areas for remediation where surface soils DU contamination levels exceeded 6.4 ...

[The Importance of Health Risk Communication in the Creation of the Anthrax Vaccine Immunization Program](#)

Apr 1, 2001 46 pages

Authors: [Bradley D. Freeman](#); [ARMY WAR COLL CARLISLE BARRACKS PA](#)

Full Text

... program matured. A greater application of health risk communication in the creation of the Anthrax Vaccine Immunization Program Agency would have generated less controversy. Studying the development and implementation of health risk communication in the anthrax program can be applied to other military vaccines or the discussions on **depleted uranium** rounds or toxic exposure standards.

[Appendix D: Kinetic Energy Penetrator Environmental and Health Considerations](#)

Jul 1990 207 pages

Authors: [SCIENCE APPLICATIONS INC MCLEAN VA](#)

Full Text

The U.S. Army is currently formulating a strategy for future kinetic energy penetrating materials. This report addresses the environmental and health issues associated with **depleted uranium** (DU) and tungsten penetrators. The objective of this study was to perform a preliminary assessment to investigate the environmental and health issues associated with DU and tungsten penetrator manufacturing, testing and recycle facilities. This work also included an assessment of ...

[Kinetic Energy Penetrator Long Term Strategy Study](#)

Jul 24, 1990 147 pages

Authors: [Michael E. Daneal](#); [ARMY ARMAMENT MUNITIONS AND CHEMICAL COMMAND ROCK ISLAND IL](#)

Full Text

To address the perceived increasing burdens associated with use of **depleted uranium** (DU) as a kinetic energy (KE) penetrator material, the ANCCON Task Group examined use of alternate materials, and considered the impacts of this in four broad areas: performance; the industrial base; environmental and health factors; and life cycle costs. Application of DU and tungsten alloy (WA) materials to the penetrators for three future weapon systems which will be fielded in the 1995 - 2000 timeframe was considered. These systems ...

[HVOF Application of Nickel and Nickel Alloy to Tungsten Heavy Alloy for Jacketed Penetrators](#)

Nov 2003 20 pages

Authors: [John V. Kelley](#); [Russell Kilbane](#); [ARMY RESEARCH LAB ABERDEEN PROVING GROUND MD](#)

Full Text

In recent years, there has been an increased desire to replace **depleted uranium** (DU) anti-armor penetrators with tungsten heavy alloy (WHA) penetrators. However, the ballistic performance of WHA does not compare with that of DU. Many methods of improving the ballistic properties of tungsten have been explored. One recent method includes jacketing a long thin core of WHA with a more ductile metal. This report examines the use of thermal-sprayed, high- velocity oxy-fuel coatings to apply the jacket material. However, ...

[Operation Desert Storm. Questions Remain on Possible Exposure to Reproductive Toxicants](#)

Aug 1994 39 pages

Authors: [Winslow Wheeler](#); [Kurt Kroemer](#); [Robert Coperland](#); [Penny Pickett](#); [Venkareddy CHennareddy](#); [GOVERNMENT ACCOUNTABILITY OFFICE WASHINGTON DC](#)

... of fuel in shower water, and the drying of sleeping bags with leaded vehicle exhaust), infectious diseases (most prominently leishmaniasis), prophylactic agents (to protect against chemical and biological weapons), **depleted uranium** (contained in certain ammunition and in the fragments of exploded rounds embedded in

Full Text casualties), pesticides and insect repellents, possible chemical warfare agents, and a large variety of compounds contained in the extensive ...

[Carcinogenicity of Embedded Tungsten Alloys in Mice](#)

Mar 2007 7 pages

Authors: [David E. McClain](#); [HENRY M JACKSON FOUNDATION FOR THE ADVANCEMENT OF MILITARY MEDICINE ROCKVILLE MD](#)

Full Text A variety of tungsten alloys and other unusual metals have begun to enter U.S. military arsenals as substitutes for **depleted uranium** (DU) in munitions. There are questions about the health effects of exposure to the tungsten alloys that are similar to those originally surrounding DU especially for embedded shrapnel exposures. The Armed Forces Radiobiology Research Institute (AFRRI) recently performed research that showed one of the militarily promising tungsten alloys to be a potent carcinogen when implanted in rats. The need to ...

[Chapter 9 - Neurotoxicological Interactions with Physical and Psychological Stressors](#)

Sep 2007 27 pages

Authors: [Karl Friedl](#); [Stephen Grate](#); [Susan Proctor](#); [ARMY RESEARCH INST OF ENVIRONMENTAL MEDICINE NATICK MA THERMAL AND MOUNTAIN MEDICINE DIVISION](#)

Full Text ... represented a difficult and relatively untapped frontier in biomedical research in chronic multi-symptom illnesses. Some GWI topics, such as blood-brain barrier integrity during stressful conditions and neurological effects of **depleted uranium** have been addressed, but others such as the neuroprotective benefits of aerobic exercise and psychosocial influences on individual stress resilience and resistance to neurotoxicity remain important areas of investigation. Current ...

[Neurobehavioral Effects of Sodium Tungstate Exposure on Rats and Their Progeny](#)

Jun 30, 2007 25 pages

Authors: [S. M. McInturf](#); [M. Y. Bekkedal](#); [A. Olabisi](#); [D. Arfsten](#); [E. Wilfong](#); [R. Casavant](#); [W. Jederberg](#); [P. G. Gunasekar](#); [G. CHAPMAN](#); [NAVAL HEALTH RESEARCH CENTER \(DET\) WRIGHT-PATTERSON AFB OH ENVIRONMENTAL HEALTH EFFECTS LAB](#)

Full Text In the mid 1990's, the use of tungsten as a replacement for lead and **depleted uranium** began for the manufacture of small arms munitions and armor penetrator munitions, respectively. Recent reports have demonstrated that tungsten can solubilize in soil and is present in some US drinking water supplies, however, little research has been conducted to determine the human health consequences of exposure. The purpose of this study was to use a battery of tests as an initial screen for potential neurobehavioral effects that ...

[Carcinogenicity of Embedded Tungsten Alloys in Mice](#)

Mar 1, 2008 12 pages

Authors: [John F Kalinich](#); [HENRY M JACKSON FOUNDATION FOR THE ADVANCEMENT OF MILITARY MEDICINE ROCKVILLE MD](#)

Full Text A variety of unique metal mixtures have entered the military arsenals of many countries in recent years. One such material is the tungsten alloys, which have been proposed as replacements for **depleted uranium** (DU) in armor-penetrating munitions. As a result, opportunities for exposure are increasingly likely. This leads to questions, similar to those originally surrounding DU, as to the health effects of exposure to the tungsten alloys, especially for embedded ...

[Radiological Scoping and Characterization Surveys Workplan, 1963 Igloo 572 Accident \(Former Medina Base\) Lackland Training Annex, Lackland Air Force Base, Texas](#)

Dec 2000 56 pages

Authors: [Steven E. Rademacher](#); [INSTITUTE FOR ENVIRONMENTAL SAFETY AND OCCUPATIONAL HEALTH RISK ANALYSIS BROOKSAFB TX SURVEILLANCE DIRECTORAT](#)

Full Text ... material dispersed as a result of the explosion was **uranium** metal that was comprised of both **depleted** and natural isotopic compositions. ... , however, on-site areas contained elevated **uranium** concentrations in soils. The highest activity concentration among on-site soil samples was 900 pCi/g of **uranium**. In May 2000, AFIERA performed a pilot scoping ... detection equipment, collection, and analysis of the soils for **uranium** and other radiological constituents. The results of this analysis indicated the presence of **uranium** in excess of background. The report contains description of proposed scoping and ...

[Hugoniot Equation of State Measurements for Eleven Materials to Five Megabars](#)

Dec 1968 140 pages

Authors: [W. M Isbell](#); [F. H. Shipman](#); [A. H. Jones](#); [GENERAL MOTORS TECHNICAL CENTER WARREN MI MATERIALS AND STRUCTURES LAB](#)

Full Text ... made on Fansteel-77 (a tungsten alloy), aluminum (2024-T4), copper (OFHC, 99.99%), nickel (99.95%), stainless steel (type 304), titanium (99.99%), magnesium (AZ31B), beryllium (S- 200 and I-400), **uranium** (**depleted**), plexiglas, and quartz phenolic. The results are compared with those of other researchers. Deviation from linear shock velocity - particle velocity was found in aluminum beginning at approximately 1. 0 megabars, probably attributable to melting in the shock ...

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