**1. Recycling gold from printed circuit boards gold-plated layer of waste mobile phones in “mild aqua regia” system    (*Open Access*)**

**Accession number:** 20203409062923

**Authors:** Wang, Ruixue (1, 2); Zhang, Chenglong (1, 2); Zhao, Yingfan (1, 2); Zhou, Yongjie (1, 2); Ma, En (1, 2); Bai, Jianfeng (1, 2); Wang, Jingwei (1, 2)

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**Abstract:** Traditional mechanical pretreatment and hydrometallurgy is the mainstream technology to recycle gold from waste printed circuit boards (PCBs). However, this method is cumbersome and often employs toxic/harsh chemicals. In the present study, gold was easily recycled from PCBs gold-plated layer of waste mobile phones (WMPs) in DMF-CuCl2-CaCl2 (DMF: dimethyl formamide) system what we call “mild aqua regia” without pretreatments or enrichment process, and the reaction system could be cyclic utilized. In such reaction system, gold could be recycled through leaching, precipitation and filtration. The reaction parameter optimization and reaction mechanisms were studied. Under the optimized conditions, the gold leaching rate and precipitation rate could reach over 99%. DMF plays a significant role in the leaching system. As a typical polar aprotic solvent, DMF cannot solvate Cl−. Thus, “Cl−” exists in a “naked state”, and it can easily react with Au. Besides, Au (III) could generate a complex through the complexation with DMF which could result in the redox potentials reduce and move the equilibrium to the Au leaching side. In summary, this study provided a fundamental basis as well as practical guidance for recovering precious metals from waste electrical and electronic equipment in an efficient manner. © 2020 Elsevier Ltd

**Number of references:** 36

**Main heading:** Printed circuit boards

**Controlled terms:** Amides  -  Cellular telephones  -  Copper compounds  -  Electronic Waste  -  Gold compounds  -  Gold plating  -  Leaching  -  Recycling  -  Redox reactions  -  Telephone circuits   -  Timing circuits

**Uncontrolled terms:** Mechanical pre-treatment  -  Optimized conditions  -  Polar aprotic solvent  -  Precipitation rates  -  Reaction mechanism  -  Reaction parameters  -  Waste electrical and electronic equipment  -  Waste printed circuit board (PCBs)

**Classification code:** 452.3 Industrial Wastes  -  539.3 Metal Plating  -  713.4 Pulse Circuits  -  718.1 Telephone Systems and Equipment  -  802.2 Chemical Reactions  -  802.3 Chemical Operations  -  804.1 Organic Compounds

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**Compendex references:** YES

**Database:** Compendex

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**Data Provider:** Engineering Village

**2. Enhanced thermoelectric performance of hot-press Bi-doped n-type polycrystalline PbS**

**Accession number:** 20203609130606

**Authors:** Li, Yihuai (1, 2, 3); Wu, Zihua (2, 3); Lin, Jinhao (2); Wang, Yuanyuan (2, 3); Mao, Jianhui (2, 3); Xie, Huaqing (2); Li, Zhen (1)

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**Abstract:** Lead sulfide (PbS) is a type of promising thermoelectric materials which is consist of elements with high natural abundance. However, the relatively low conversion efficiency limits its further application due to the high lattice thermal conductivity of PbS compared with that of PbTe. It has been widely accepted that nanostructuring and doping are effective ways to enhance the thermoelectric properties. Herein, nano/micro structure Bi doped PbS materials have beensynthesized by a facile method of hydrothermal synthesis. The nano/micro structure material systems exist abundant interface which could scatter mid- and low-frequency phonons effectively, combined with point defect such as Bi–Pb scattering high-frequency phonons, and thus the results show that the lattice thermal conductivity of PbS decreases with the increasing concentration of Bi3+ doping as expected. Moreover, the optimal power factor (PF) can be obtained by tuning the carrier concentration and mobility at the same time. The optimal thermoelectric figure of merit (ZT) can reach 0.89 for Pb0.96Bi0.04S at 773K and rises with the increase of the temperature without sign of saturation. Our work may shed light to further possible and environmentally friendly application of PbS-based thermoelectric materials. © 2020

**Number of references:** 38

**Main heading:** Lead compounds

**Controlled terms:** Carrier concentration  -  Crystal lattices  -  Hall mobility  -  Hole mobility  -  Hydrothermal synthesis  -  IV-VI semiconductors  -  Phonons  -  Sulfur compounds  -  Tellurium compounds  -  Thermal conductivity   -  Thermoelectric equipment  -  Thermoelectricity

**Uncontrolled terms:** High frequency phonons  -  Lattice thermal conductivity  -  Low-frequency phonon  -  Optimal power factors  -  Thermo-Electric materials  -  Thermoelectric figure of merit  -  Thermoelectric performance  -  Thermoelectric properties

**Classification code:** 615.4 Thermoelectric Energy  -  641.1 Thermodynamics  -  701.1 Electricity: Basic Concepts and Phenomena  -  712.1 Semiconducting Materials  -  802.2 Chemical Reactions  -  933.1.1 Crystal Lattice  -  933.3 Electronic Structure of Solids

**Numerical data indexing:** Temperature 7.73e+02K

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**Database:** Compendex

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**Data Provider:** Engineering Village

**3. Experimental optimization of nanofluids based direct absorption solar collector by optical boundary conditions**

**Accession number:** 20204009264046

**Authors:** Wang, Kongxiang (1); He, Yan (2); Zheng, Zhiheng (1); Gao, Jingqiong (1); Kan, Ankang (3); Xie, Huaqing (1); Yu, Wei (1)

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**Language:** English

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**Document type:** Journal article (JA)

**Publisher:** Elsevier Ltd

**Abstract:** Direct absorption solar collector (DASC) is regarded as one of the most promising next-generation solar energy collection technology. Most researches focus on the photothermal performance of working fluids. While the optical boundary condition, which is another important factor influencing the efficiency of DASC, receives little attention. In this paper, the ethylene glycol based TiN nanofluids are used as the research objective. The temperature-dependent optical properties of nanofluids are experimentally investigated in detail, and when the temperature increases from 0 °C to 60 °C, the optical absorption performance of fluids could enhance ~50%, which means that the heated fluids has stronger absorption capability. To improve the photothermal conversion efficiency of collector system, two types of irradiation directions have been studied for the collector, and different heat transfer mode of each type has been experimentally analyzed. The experimental results show that the added nanoparticles can significantly enhance the photothermal conversion efficiency of solar collectors. When the concentration of TiN is 0.003 wt.%, the photothermal conversion efficiency of bottom irradiation mode achieves ~45%, much higher than that of side irradiation. However, the side irradiation collector can save ~40% of time to reach steady-state compared with the bottom irradiation collector. Moreover, two kinds of collectors have a uniform temperature field (~10 °C difference between different depth) over 1.0 cm irradiation depth. Consequently, the prospects for possible applications of ethylene glycol based TiN nanofluids in high-efficiency DASC are presented. © 2020 Elsevier Ltd

**Number of references:** 43

**Main heading:** Collector efficiency

**Controlled terms:** Aliphatic compounds  -  Boundary conditions  -  Conversion efficiency  -  Ethylene  -  Ethylene glycol  -  Heat transfer  -  Irradiation  -  Light absorption  -  Nanofluidics  -  Optical properties   -  Polyols  -  Radiation  -  Solar energy  -  Titanium nitride

**Uncontrolled terms:** Absorption capability  -  Absorption performance  -  Experimental optimization  -  Photothermal conversion efficiencies  -  Solar energy collections  -  Temperature dependent  -  Temperature increase  -  Uniform temperature field

**Classification code:** 525.5 Energy Conversion Issues  -  641.2 Heat Transfer  -  657.1 Solar Energy and Phenomena  -  702.3 Solar Cells  -  741.1 Light/Optics  -  761 Nanotechnology  -  804.1 Organic Compounds  -  804.2 Inorganic Compounds

**Numerical data indexing:** Size 1.00e-02m, Temperature 2.73e+02K to 3.33e+02K

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**4. Dilute molybdenum atoms embedded in hierarchical nanoporous copper accelerate the hydrogen evolution reaction**

**Accession number:** 20203809194119

**Authors:** Luo, Min (1); Peng, Wei (2); Zhao, Yang (2); Lan, Jiao (2); Peng, Ming (2); Han, Jiuhui (3); Li, Hongju (4); Tan, Yongwen (2)

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**Language:** English

**ISSN:** 13596462

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**Document type:** Journal article (JA)

**Publisher:** Acta Materialia Inc

**Abstract:** The development of earth-abundant, non-noble, high-performance hydrogen evolution reaction (HER) electrocatalysts is still a highly challenging but vitally important issue for energy conversion system. Herein, we reported a self-supported Mo modified hierarchical nanoporous Cu as an efficient electrocatalyst for hydrogen evolution. The optimized nanoporous Cu-Mo electrocatalysts with extremely dilute Mo content exhibits a high HER activity with a negligible onset potential, a small Tafel slope, and an excellent durability in alkaline solution. The dealloying process provides nanoporous Cu-Mo electrocatalysts a unique three-dimensional interconnected bicontinuous nanoporous architecture, which can not only offer high-density catalytic active sites for HER, but also accelerate the desorption of hydrogen molecule from catalysts surface. Density functional theory (DFT) calculations reveal that the introducing of Mo into Cu matrix can accelerate water adsorption and dissociation and optimize adsorption-desorption energetics of H intermediates, thus improving the intrinsic HER activity of nanoporous Cu-Mo electrocatalysts. © 2020

**Number of references:** 37

**Main heading:** Hydrogen evolution reaction

**Controlled terms:** Binary alloys  -  Catalyst activity  -  Copper  -  Copper alloys  -  Dealloying  -  Density functional theory  -  Desorption  -  Electrocatalysts  -  Electrolysis  -  Energy conversion   -  Molybdenum

**Uncontrolled terms:** Adsorption desorption  -  Alkaline solutions  -  Catalysts surface  -  Catalytic active sites  -  Desorption of hydrogen  -  Energy conversion systems  -  Hydrogen evolution  -  Nano-porous coppers

**Classification code:** 525.5 Energy Conversion Issues  -  543.3 Molybdenum and Alloys  -  544.1 Copper  -  544.2 Copper Alloys  -  802.2 Chemical Reactions  -  802.3 Chemical Operations  -  803 Chemical Agents and Basic Industrial Chemicals  -  922.1 Probability Theory

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