

OC-64

PHOTOCATALYTIC PROPERTIES OF BiFeO_3 AND $\text{Bi}_5\text{Ti}_3\text{FeO}_{15}$ BASED POWDERS

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Bismuth ferrite (BiFeO_3) and bismuth titanate ferrite ($\text{Bi}_5\text{Ti}_3\text{FeO}_{15}$) are studied a lot in recent years because of their specific structure and potential to act as single phase multiferroics. Thanks to the optical band gap energy of 2.3-2.8 eV for BiFeO_3 and 1.8-2.3 eV for $\text{Bi}_5\text{Ti}_3\text{FeO}_{15}$, these materials are also interesting for photocatalytic and solar energy applications, and studies of using $\text{Bi}_5\text{Ti}_3\text{FeO}_{15}$ for this purpose are very rare. Sol-gel methods were used to produce BiFeO_3 and BiFeO_3 -modified diatomaceous earth, while $\text{Bi}_5\text{Ti}_3\text{FeO}_{15}$ was obtained sol-gel and solid-state methods. These powders were characterized, and their visible light photocatalytic activity for decomposition of methylene blue was tested in acidic, close-to-neutral and alkaline conditions. Fenton-like catalysis was also tested. Influence of synthesis method, microstructure, and catalyst composition on dye degradation will help in proposing the mechanism of adsorption and photocatalytic processes.

OA-65

IMMOBILIZATION OF SIMULATED RADIOISOTOPES IN ALKALI ACTIVATED INORGANIC POLYMERS

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The increasing importance of nuclear energy in the World's energy supply makes radioactive waste conditioning a constantly emerging issue. The current matrices (ordinary portland cement, bitumen) used for radioactive waste (excluding spent nuclear fuel) immobilization are far from being ideal (e.g. they have poor fire resistance and acid corrosion resistance, and have high leachability). In ordinary portland cement, radiolytic hydrogen production is a serious problem because the hydrogen bubbles induce mechanical stress in the matrix which may ultimately lead to the cracking of the material thus exposing more leachable surface to the environment.

The solution (AAC) which has portland cement and materials have the adsorbed water content yield becomes ne

The goal of optimizing its composition cement. The experiments with CsCl and SrCl em of U-235: Cs-137

Keywords: radioisotopes, nuclear technology

OA-66

CATALYTIC ACTIVITY OF MOL

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Billions of people live on a similar budget in an increasing demand for understanding of exchange with nature under reaction conditions be exploited in C

In our research, we synthesized – MCF-17, SBA-15 template (replicated) TPR, NH_3 -TPD et flow reactor in the

Tuning the catalyst and selectivity properties for molecular level plenty of results on sight into green cat

The solution to these issues can be the utilization of alkali activated cements (AAC) which have superior chemical and thermal stability compared to ordinary portland cement and also have lower leachability by several orders of magnitude. These materials have the advantage of not containing water as a structural element and the adsorbed water content can be removed by heat treatment thus the radiolytic hydrogen yield becomes negligible in AAC radioactive waste forms.

The goal of my research is to maximize the immobilization of the matrix by optimizing its composition and to perform control experiments with ordinary portland cement. The experiments include leach tests with AAC matrices with small amounts of CsCl and SrCl embedded in them in order to simulate the most common fission products of U-235: Cs-137 and Sr-90 respectively.

Keywords: radioactive waste, geopolymer, alkali activated cement, immobilization, nuclear technology ties

OA-66

CATALYSIS REVOLUTION: WITH NANOTECHNOLOGY AND MOLECULAR LEVEL UNDERSTANDING TOWARDS A GREEN FUTURE

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Billions of dollars are investigated into information industry. Its less known, that similar budget is used for planning catalysis and industrial catalytic processes. The increasing demand for high activity and selectivity products needs new technologies and understanding of heterogeneous catalysis. The former trial-and-error method can be exchange with new techniques using in-situ methods for molecular level understanding under reaction conditions as well as controlled nanotechnology. These techniques may be exploited in CO₂ activation as well as other green methods.

In our research, mono and bimetallic nanoparticles with controlled average sizes were synthesized and anchored them on different 3D mesoporous oxide materials (SiO₂ – MCF-17, SBA-15, Co₃O₄, MnO₂, Fe₂O₃, NiO, CeO₂) prepared by the soft and hard template (replica) method. HRTEM-ED-EDX, SEM-EDX, DRIFTS, XRD, BET, H₂-TPR, NH₃-TPD etc. was used for characterizations. Catalytic tests were performed in a flow reactor in the gas phase connected to a HP GC-FID-TCD.

Tuning the size of the particles as well as the oxide/metal interfaces high activity and selectivity processes are favorable. NAP-XPS as well as DRIFTS techniques helped for molecular level understanding of the processes for future catalysts design. I will show plenty of results on the field of nanocatalysis and CO₂ activation reactions towards a new sight into green catalysis.

SZIMULÁLT RADIOIZOTÓPOK IMMOBILIZÁCIÓJÁNAK VIZSGÁLATA ALKÁLI AKTIVÁLT SZERVETLEN POLIMEREKBE

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A nukleáris energiának a világ energiaellátásában való egyre nagyobb térnyerése miatt folyton felmerül a radioaktív hulladékok kezelésének kérdése. A jelenlegi, radioaktív hulladékok (a kimerült fűtőelemek kivételével) beágyazására használt anyagok (cement, bitumen) kioldódási tulajdonságai, tűzállósága, savakkal szembeni ellenálló képessége, stb. korántsem ideális. További probléma a radiolitikus hidrogéntermelődés, ami hosszútávon jelentős károkat okozhat a beágyazóanyag szerkezetében, így megkönnyítve a radioaktív izotópok kijutását a környezetbe. Ezekre a problémákra megoldást jelenthet alkáli aktivált kötőanyagok használata, melyek kémiai és termikus stabilitása felülmúlja a közösleges portland cementét, valamint immobilizációs képességük is több nagyságrenddel jobb. Ezen anyagrendszerek nagy előnye, hogy a portland cementtel ellentétben nem tartalmaznak szerkezeti vizet, és az egyéb módon megkötött víztartalom hőkezeléssel eltávolítható, így a víz radiolízise miatt felmerülő nehézségek nem jelentkeznek a radioaktív hulladékformában. A kutatásom célja az alkáli aktivált cementek összetételének optimalizálása az immobilizáció szempontjából, valamint az alkáli aktivált rendszerek összehasonlítása a portland cementtel. E cél teljesítéséhez kioldódáskísérletek elvégzésére van szükség, melyek során cézium-kloridot és stroncium-kloridot ágyazok be a változatos összetételű mátrixokba. A választott anyagokkal a két leggyakoribb U-235 hasadványterméket, a Cs-137 és a Sr-90 izotópokat kívánom szimulálni.

COMPARISON OF DIFFERENT

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One of the most common ways to avoid this meat is to buy sausage from different separated meat. Bologna sausage is made from many species of meat. Information on the analyses, organoleptic properties and purchase of bologna

IMMOBILIZATION OF SIMULATED RADIOISOTOPES IN ALKALI ACTIVATED INORGANIC POLYMERS

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The increasing importance of nuclear energy in the World's energy supply makes radioactive waste conditioning a constantly emerging issue. The current matrices (ordinary portland cement, bitumen) used for radioactive waste (excluding spent nuclear fuel) immobilization are far from being ideal (e.g. they have poor fire resistance and acid corrosion resistance, and have high leachability). In ordinary portland cement, radiolytic hydrogen production is a serious problem because the hydrogen bubbles induce mechanical stress in the matrix which may ultimately lead to the cracking of the material thus exposing more leachable surface to the environment. The solution to these issues can be the utilization of alkali activated cements (AAC) which have superior chemical and thermal stability compared to ordinary portland cement and also have lower leachability by several orders of magnitude. These materials have the advantage of not containing water as a structural element and the adsorbed water content can be removed by heat treatment thus the radiolytic hydrogen yield becomes negligible in AAC radioactive waste forms. The goal of my research is to maximize the immobilization of the matrix by optimizing its composition and to perform control experiments with ordinary portland cement. The experiments include leach tests with AAC matrices with small amounts of CsCl and SrCl embedded in them in order to simulate the most common fission products of U-235: Cs-137 and Sr-90 respectively.