ПРОБЛЕМЫ НЕДРОПОЛЬЗОВАНИЯ

МЕЖДУНАРОДНЫЙ ФОРУМ-КОНКУРС МОЛОДЫХ УЧЕНЫХ

Сборник научных трудов

Часть II

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NOVEL ENE-YNE BASED COMPOUNDS: DESIGN AND APPLICATIONS

Organic functional materials (π-electron systems) have received considerable attention in diverse fields of applications in recent years.[1] Hence, the design and synthesis of novel compounds is of crucial importance. The topic of the talk is a systematic study on the synthesis, modifications and functionalizations as well as applications of ene-yne[2] compounds (Fig. 1).

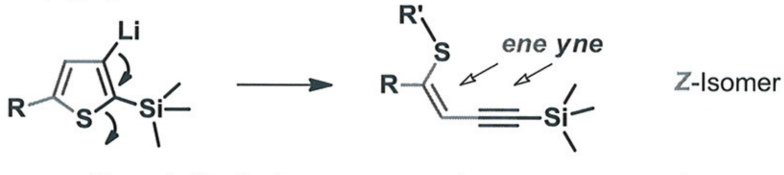

Figure 1. Synthetic strategy towards ene-yne compounds

The first part of the paper outlines an investigation on the synthesis (*via* thiophene ring-opening) and potential modification of ene-yne compounds. As a result, an improved procedure enabling to synthesize spacer-extended ene-yne scaffolds is obtained. To gain further insight to reaction kinetics and mechanistics an ATR-IR probe is applied to inline monitor highly reactive intermediates.[3] The last part focuses on the application of the developed substrates in areas such as organic semi-conductors and non-linear optical (NLO) materials.[4]

References

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IDENTIFICATION OF DIFFERENT RESISTIVE PROCESSES ON $SRTI_{0.7}FE_{0.3}O_{3-\Delta}$ THIN FILM MODEL SOFC ANODES

The increasing amount of renewable electricity generation is also leading to volatility in electricity production. To ensure sufficient grid stability, a large amount of operating reserve will be required. For this application Solid Oxide Fuel Cells (SOFCs) are promising candidates. They offer high conversion efficiency, dynamics and fuel flexibility. The possible rated power per unit covers a wide range (10W-several MW). They are believed to be applicable as auxiliary power units or small-medium scale stationary combined electricity and heat supply. Moreover, the cell reactions are principally reversible, so fuel-cell and electrolysis-cell operation may be possible with one single device. Currently commercial systems operate at temperatures between 800°C and 1000°C, which causes unfavorable side reactions and the need of expensive materials for cell interconnections and sealing. A reduction of the operating temperature significantly below 800°C requires the development of new electrode materials with higher catalytic activity at intermediate temperature. Perovskite-type mixed ionic and electronic conductors are widely investigated for application as cathodes. Some of these (e.g. $SrTi_{0.7}Fe_{0.3}O_{3-\delta}$) are also stable under reducing conditions, which raises the question, whether they are applicable as anodes. For further optimization of the electrode design and used materials, a more detailed mechanistic understanding of the elementary processes taking place in the electrodes is of high relevance. For mechanistic investigations, thin film microelectrodes are well suited. They have well-defined geometry, sufficient reproducibility and simple and well known electronic and ionic transport paths.

For this work, dense thin films of $SrTi_{0.7}Fe_{0.3}O_{3-\delta}$ were prepared on single-crystalline yttria-stabilized zirconia substrates via pulsed laser deposition. Microelectrodes were produced with photolithographic techniques and investigated by means of electrochemical impedance spectroscopy in H_2-H_2O atmosphere. Under reducing conditions, the electric conductivity of $SrTi_{0.7}Fe_{0.3}O_{3-\delta}$ strongly decreases, which makes application of a metallic thin film grid necessary. Even with such a current collector, the electronic as well as ionic transport in the electrode cause relevant contributions to the electrode impedance. For detailed insight in the electrode reactions, the resistive contributions from electronic and ionic transport and surface reaction have to be separated and quantified. A novel electrode and metal grid design was developed, where two intermeshing metal finger structures are placed on one single microelectrode. Consequently, two different impedance measurement modes can be applied to one electrode (see Fig.2). The simultaneous fitting of the two derived impedance spectra with one parameter set allows simultaneous acquisition of electronic and ionic conductivity, as well as the oxygen exchange rate and chemical capacitance on one single microelectrode. With this technique it can be verified, that the surface reaction is the rate determining step for thin film electrodes with a fine structured metal grid, whereas electronic transport is limiting when the metal grid size is too large.

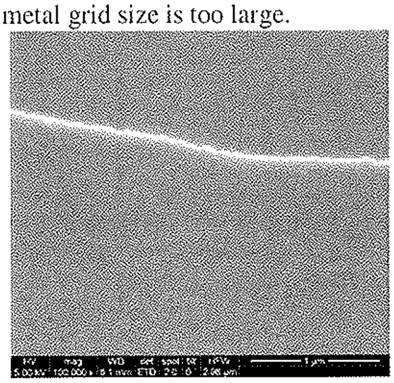

Figure 1. SEM image of the thin film electrode

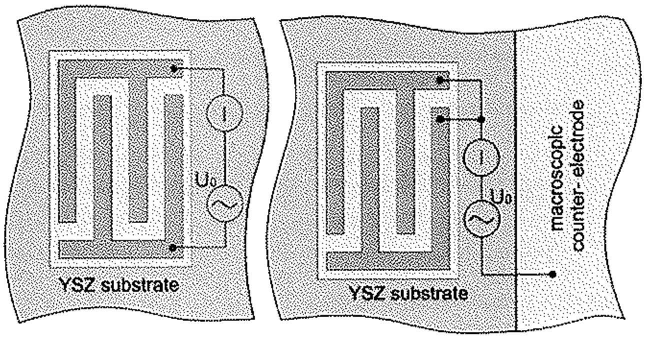

Figure 2. Possible measurement modes: in plane (left), electrochemical (right)

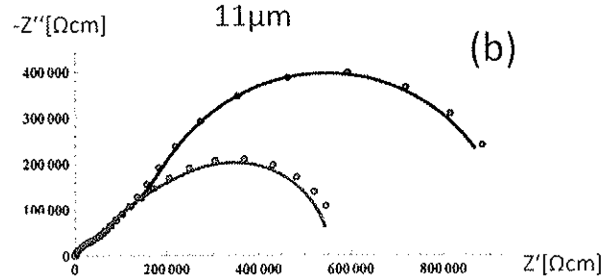

Figure 3. Typical measured impedance spectrum (dots) for in-plane (red) and electrochemical measurement (blue) with fit (solid lines)

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EDUCATION AND TRAINING FOR BETTER SAFETY COMPETENCE: EXPERIENCES FROM GERMANY TO VIETNAM

Introduction

Research on risk management [1], [2], [3], [4] showed human behaviors are main reasons for incidents and d accidents in mining industry, especially in underground coal mines. According to [5], there are no new dents, just other people repeating the same mistakes. Therefore, it is necessary to invest in sharing and training ffective risk management is not just technical solutions and it would be helpful for people to learn of lessons re the incidents/accidents occur. Education and training, then, become a key for risk management and help to ote the human behaviors to get better results in occupational safety and health management.

Training in RAG for better risk management

RAG is a unique hard coal mining corporation in Western Germany. To reach their target of "Zero – acci- during the last twenty years they have been playing hard efforts on education and training, to change the ing and behaviors of their staff and workers [6]. Managers in RAG understood that their labor force is the criti- important resource [7], thus, in their education and training programs, learners are always put into the central