CREATION TABLETS WITH COMPOSITE MATERIAL MICROPOWDERS BY UNIAXIAL PRESSING FOR USE IN THIN-FILM DEPOSITION

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Abstract: This study presents a novel approach to the fabrication of tablets using composite material nanopowders through the process of uniaxial pressing. These tablets are designed for utilization in thin-film deposition applications. The study explores the formulation of composite micro-powders and their subsequent compacting into tablets, offering improved control over the deposition process. The key advantages of this approach include enhanced uniformity, stability, and efficiency of thin-film deposition. The experimental results demonstrate the feasibility and effectiveness of the proposed method, paving the way for advancements in thin-film deposition technology.

Key words: Composite materials, nanopowders, Tablets, Uniaxial pressing, Thin-film deposition.

Introduction

Thin-film deposition is a crucial process in various industries, including electronics, optics, and energy. It involves the precise deposition of thin films onto substrates to achieve desired properties such as conductivity, transparency, or barrier properties. The quality and performance of thin films heavily rely on the uniformity and stability of the deposition process. Therefore, there is a growing demand for innovative methods to improve the control and efficiency of thin-film deposition.

Results and discussion

The fabrication of tablets using composite material micro-powders through the process of uniaxial pressing presents a novel approach in thin-film deposition technology. Uniaxial pressing involves compacting the nanopowders into tablet form under controlled pressure. This method offers several advantages, including ease of handling, uniformity, and reproducibility.

After synthesizing composite materials in the form of nanopowders using sol-gel technology, the subsequent step involved the utilization of uniaxial pressing method for compacting the materials into tablets (Fig. 1).

a) b)

a- pressing device; b- Mold

Figure 1 – Mold for manufacturing prototypes of tablet targets with a diameter of 12 mm using uniaxial pressing

To facilitate the compaction process, an aqueous solution of polyvinyl alcohol with a concentration ranging from 3-6 wt. % was used as a binder, with the concentration being dependent on the specific requirements of the final product and pressing mode. The resulting tablets had a diameter of 12.5 mm and a thickness of 5 mm, although the thickness varied between 3 mm and 10 mm (Fig. 2).

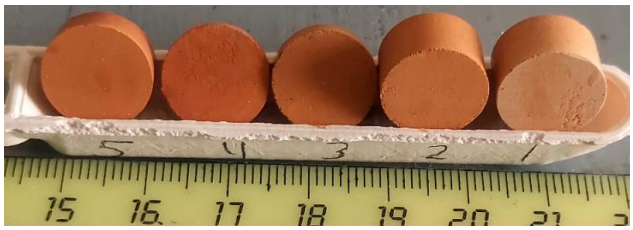

Figure 2 – Photo of tableted targets annealed in air at T=700 ºC (1 hour)

The phase transformations occurring within the composite materials were analyzed through X-ray phase analysis, while scanning electron microscopy (SEM) was employed to investigate the surface morphology and internal structure of the synthesized xerogel preforms. Subsequently, these tablets were employed for film deposition utilizing the pulsed laser evaporation method, leading to the production of nanostructured films based on the composite materials.

Utilizing the aforementioned tablets, the structural and optical characteristics of thin films (with a thickness of approximately 100 nm) generated through pulsed laser evaporation were evaluated. The composition of the tablet was reiterated, and it was observed that the structure of the films primarily comprised agglomerates or domain structures, contingent upon the type and concentration of ions employed for sputtering. This observation enables the selection of appropriate technological parameters to achieve films with the desired structure and thickness [1-2].

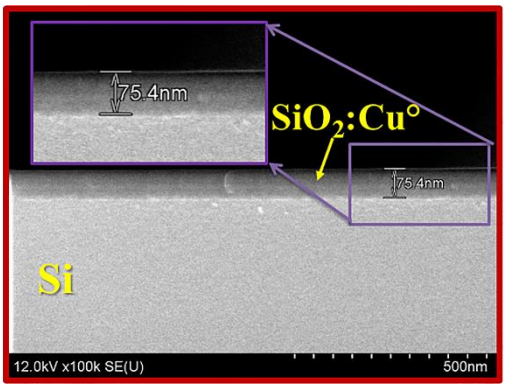

Figure 3 – SEM image of the cleavage surface of a thin film deposited by pulsed laser evaporation of a tablet of the composition SiO_2 : Cu° on a polished silicon substrate

Conclusion

The creation of tablets with composite material nanopowders by uniaxial pressing offers a promising approach for enhancing thin-film deposition processes. The utilization of these tablets provides improved control, uniformity, and efficiency in the thin-film deposition of various materials. The experimental results demonstrate the feasibility and effectiveness of the proposed method, showcasing its potential for advancement in thin-film deposition technology.

In conclusion, the fabrication of tablets using composite material nanopowders through uniaxial pressing presents a novel and promising approach for thin-film deposition. The control and uniformity achieved through this method provide significant advantages in various industries where precise and efficient thin-film deposition is required. With further research and development, this innovative approach has the potential to revolutionize thin-film deposition technology, opening up new possibilities for advanced material applications in electronics, optics, and energy sectors.

References

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INTERACTIVE TELEGRAM BOT FOR PROMOTION OF EDUCATIONAL SERVICES OF THE UNIVERSITY

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Abstract: In today's digital era, universities are constantly seeking innovative ways to promote their educational services and attract prospective students. This article introduces the concept of an interactive Telegram bot as a powerful tool for enhancing the promotion of educational services offered by universities. The bot serves as a virtual assistant, providing real-time information, answering inquiries, and engaging with potential students in a user-friendly manner. With its wide reach and interactive capabilities, the Telegram bot offers an effective platform for showcasing various educational programs, admission processes, academic resources, and campus life. By leveraging this technology, universities can not only streamline their communication efforts but also enhance their brand image and engage with a wider audience.

Key words: interactive Telegram bot, educational services, university promotion, digital marketing, student engagement.

Introduction

Universities worldwide face the ongoing challenge of attracting and engaging prospective students in an increasingly competitive educational landscape. In this digital age, traditional marketing methods are no longer sufficient to capture the attention of tech-savvy individuals. Consequently, universities are turning to innovative digital solutions to effectively promote their educational services. One such solution that has gained prominence is an interactive Telegram bot.

Results and discussion

The evolution of chatbot technology has led to the emergence of interactive Telegram bots, which have revolutionized the interaction between universities and students. These bots utilize the messaging platform Telegram to deliver personalized and real-time assistance to potential students. Through their conversational interfaces and automated responses, interactive Telegram bots offer a seamless user experience and facilitate efficient communication [1].

An interactive Telegram bot functions as a virtual guide, providing prospective students with comprehensive information about various educational programs, admission requirements, scholarship opportunities, and campus facilities. Students can engage with the bot to receive instant responses to their queries, access relevant resources, and receive personalized recommendations. This high level of interactivity enhances student engagement and support, ultimately influencing their decision-making process [2-3].

The admission process can be intricate and overwhelming for prospective students. However, an interactive Telegram bot simplifies this process by offering step-by-step guidance on application procedures, necessary documents, and important deadlines. Additionally, it can inform students about upcoming events, campus tours, and open house sessions, ensuring that they remain informed and connected throughout their educational journey.

Given the increasing utilization of technology, particularly social media platforms, for accessing information, it became necessary to develop a mechanism via the Telegram platform to introduce our university “Sukhoi State Technical University of Gomel”. To cater to the needs of students, particularly international students, we created several promotional pages for the university. These pages gained popularity among student circles and were divided into multiple sections for each college group, facilitating easy retrieval of information for students. Figure 1 provides examples of some of these pages.