

Returnee's Report

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| Name : | Yusuke DAIKO |
| Status : | Assistant Professor |
| Name of the University / Country | Friedrich-Alexander-Universität Erlangen-Nürnberg / Germany |
| Research Theme : | Anion doping into ZnO |
| Duration : | 2013/9/26~2014/3/19 (175days) |
| Advisor's name at the University : | Prof. Wolfgang Peukert |
| Research Theme in detail : | |
| <p><Goal></p> <p>ZnO is a typical n-type semiconductor with the band gap around 3.3 eV and has attracted much attention because its electric, magnetic, photonic and photocatalytic properties change drastically by the introduction of vacancy and/or anion doping. Nitrogen (N) doping is a candidate to obtain p-type ZnO, and also N-doped ZnO shows a high photocatalytic activity under visible light. Similarly, sulfur (S) doped ZnO shows a good photocatalytic activity. However, doping mechanism of anions and the method to control the levels of doping have not completely been understood yet. Recently, first-principles calculation results suggest the correlation between the amount of oxygen vacancy of ZnO and anion doping. FAU colleagues and I studied the formation of oxygen vacancy of ZnO and its relation with the anion doping.</p> <p><Result></p> <p>It was found that the oxygen vacancy of ZnO induced by the mechanical stress, and the amount of vacancy could be controlled by changing the reaction time, energy and temperature <i>etc.</i> Also, we got some important knowledge about the control of doping level for both nitrogen and sulfur, respectively. We will report them in a paper soon.</p> <p><Achievement></p> <p>We are able to obtain S-doped ZnO rapidly/easily with relatively low fabrication cost by the mechanical stress-assisted process above mentioned. The photocatalytic activity of the S-doped ZnO was also confirmed using visible light LED. Further studies about the surface modification of ZnO using the oxygen vacancy on surfaces are in progress. In the case of N-doped ZnO, we have obtained 10 ~ 25 nm sized particles, and electrical properties are currently studying.</p> | |
| About the laboratory I belong to (Number of faculty members and students, Methods used in research activity: | |

- two professors and many PhD students, totally around 80 people in the group
- early start experiment, early go home
- regular discussion in English about the results of study

Comments about the workshops and seminars I attended:

- Research meeting for young researchers including not only FAU but also other university members.

My Ambitions:

Everything was really a fruitful experience for me and I did lots of collaboration work with many young researchers. I am sure this collaboration will keep/extend as long as I am researcher. One my friend establishes a new equation, which support my original study in Japan strongly. I would like to improve these research collaboration networks more tightly. Also, I would like to make a new material based on anion-doped ZnO and to find a new application through the collaboration study with FAU.

Advice and suggestions for young researchers who will visit partner schools and other institutions :

In my feeling, English would help communication each other, but more important is that we just jump into a new world without any protection and ask for help to someone whenever you need. Soon while, they are also interested in your research. Please visit lots of laboratories/professors as possible as you can. You will find something fundamental/interesting issues that you cannot obtain by just reading their papers. I recommend bringing a short presentation about your research with name card, which would help to discuss/establish a new collaboration.



Christmas market in Nürnberg



My friend, Doris and me