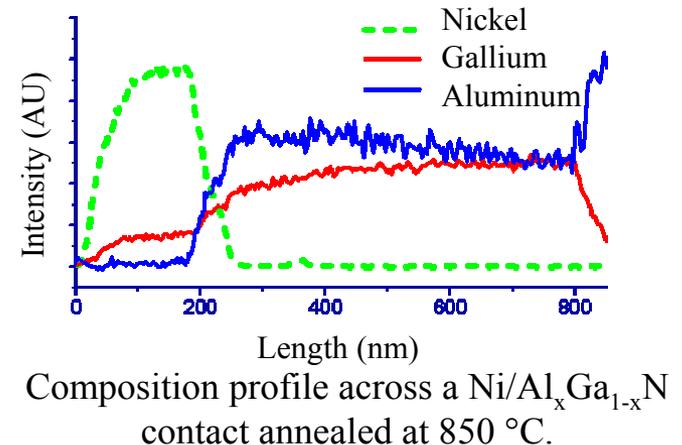
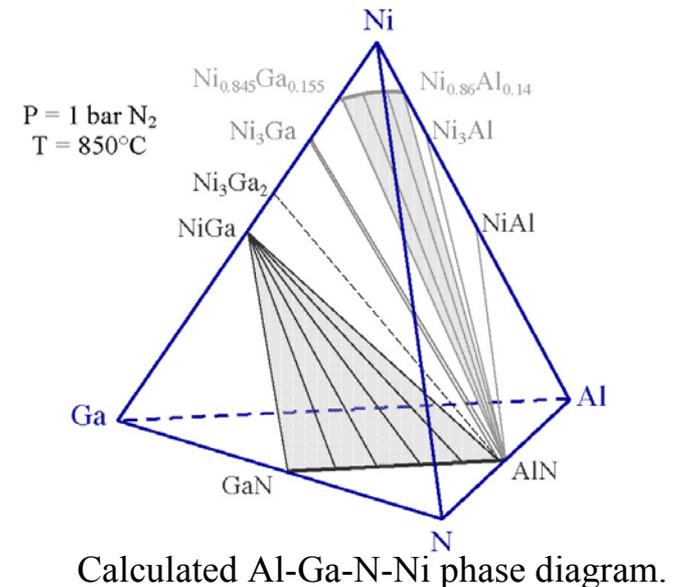


Contacts to Group III Nitride Semiconductor Alloys

Suzanne Mohny, Penn State, DMR-0308786

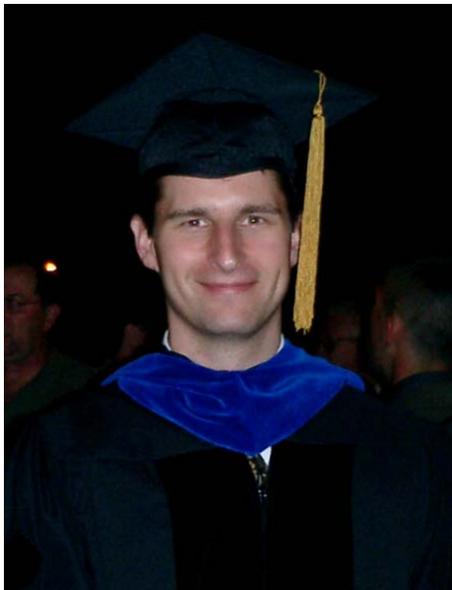
Metal contacts to group III nitride alloy semiconductors are required for light emitting diodes that may one day provide energy-efficient white lighting, ultraviolet laser diodes under development for biological agent detection, and high frequency/high power transistors that are promising for mobile communications. Researchers at Penn State have discovered that the reaction between annealed metal contacts and the semiconductor $\text{Al}_x\text{Ga}_{1-x}\text{N}$ leads to a shift in the composition of the semiconductor alloy (a change in x). Such a shift has important consequences for the electrical properties of the underlying semiconductor and the contact itself. This shift is consistent with thermodynamic driving forces in these contacts, as modeled by the researchers, and may be a more general phenomenon occurring in other metal/semiconductor alloy systems.



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Education: Brett Hull earned a Ph.D. in Materials Science, with support for his thesis research coming from this project. He is now employed at Cree, Inc. A new student, Mary Horsey, joined the project in 2004. Besides the graduate assistants on the project, other students are also benefiting from the program. The PI is incorporating knowledge about contacts to the group III nitride semiconductors from this project into a graduate course she is teaching (Metals in Electronics). The course has an enrollment of 22 students.



Outreach: The PI participated during 2003–2004 in open houses for the general public (Earth and Mineral Sciences Exposition) as well as for visitors from industry and government (Materials Day). During these events, she communicated to different audiences advances in the field of group III nitride semiconductors. One application of these semiconductors is light emitting devices, and the Earth and Mineral Sciences Exposition included hands-on demonstrations of light emitting diodes for grade school and high school students. A graduate student supported on this project, Brett Hull, also volunteered as an instructor at a workshop for high school girls during which flashlights were assembled using light emitting diodes.