NANO HIGHLIGHT
Self-Assembled Silicide Nanowires

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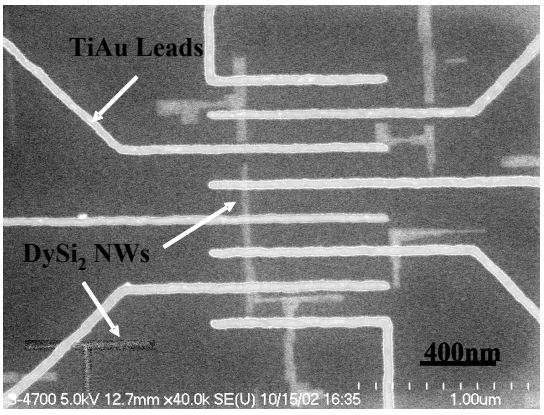
PIs: **P. Bennett, J. Bird, N. J. Tao, M. vanSchilfgaarde**
Arizona State University

It has recently been found that some metals will spontaneously self-assemble on a heated silicon surface to form metallic silicide nanowire (NW) structures with nominal dimensions: 1 nm thick, 10 nm wide and 1000 nm long.[1, 2] Such structures are superior to those that can be fabricated directly by lithographic means: they are smaller and have better quality, since they are single-crystal structures with atomically perfect terminating surfaces (facets). These NWs have potential application as low-resistance interconnects or as nano-electrodes for attaching molecular species.

It is thought that formation of the silicide NWs is driven by epitaxial constraints which are specific to the crystal structure of the silicide and the underlying silicon substrate. In this regard, rare-earth metals on Si(100) are particularly suitable. However this materials system is limited in scope and may be problematic for applications due to high reactivity. Our group has discovered that many other metal/silicon systems also form self-assembled silicide NWs, including: Ti, Co, Ni, Pd on Si(111), Si(100) and Si(110).[3, 4] This provides a rich materials system in which to explore fundamental and practical materials properties.

We have begun measurements of electron transport in silicide NWs at low temperature and high magnetic field. From this we can determine fundamental properties such as carrier density and scattering lengths, both coherent and incoherent. An example is shown in the figure below from the work of J. Bird and graduate student Jie-Feng Lin.



SEM image showing $DySi_2$ NWs on Si(100). The contact structure is fabricated using electron-beam lithography. The multiple contacts to a single NW will allow 4-point measurements that suppress effects of contact resistance.

References

For further information, link to http://phy.asu.edu/Nanowire_NIRT or email **<peter.bennett@asu.edu>**

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