Inspection of epitaxial mistakes at the atomic level

In September 2018, the Apple Company successfully released a new generation of iPhones with 7 nm processor technology. This means that the technology, where the characteristic size of lithographical features is on the same order of magnitude as the lattice parameter of the semiconductor, is commercially mature. Clearly, such a technology relies of high quality material. For many applications a perfect epitaxial growth (crystal growth of semiconductors) is required where every atom is located in its correct position. In this atomic level LEGO game, everything is important, growth rate, ratio of the elements in gas and solid phases, temperature, atomic cleanness of the initial semiconductor surface, etc.

This project is dedicated to atomic level structural investigation of GaAs based monocrystalline structures containing layers of different chemical compositions. The investigation will involve atomic scale imaging of the interface and identification of any chemical or crystalline defects present there. This will then be used to explain why in some cases those layers form very smooth interface, and in other cases a phase separation of the growing material occurs.

Skills/knowledge acquired through the project:
- Nanoscopic methods of structural investigation on atomic level, including FIB specimen preparation, TEM imaging and EDX chemical mapping
- Basic principles of epitaxial growth.

Background requirements:
- Knowledge of solid state/semiconductor physics

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