Spectroscopy and scattering of (quasi)2D electronic states in oxide heterointerfaces and topological insulators

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Metallicity in heterointerfaces between bulk oxide insulators and the quantum spin Hall effect appeared side by side in the listing of breakthroughs in Science magazine in December 2007. Now that the 3D topological insulators have been discovered, possessing 2D topologically protected surface states, both the oxide heterointerfaces and TI research share a common interest in two-dimensional electronic states sandwiched between or terminating special types of semiconductors or insulators.

In this colloquium, I'll give an overview of recent research in Amsterdam on these two new flagship quantum matter systems. For the heterointerfaces, I will use HIKE-PES data to discuss the potential buildup in $LaAlO_3$ on $SrTiO_3$. As regards the topological insulators, I'll present the current status of our research into the synthesis of systems with higher bulk resistance and the achievement of a zero resistance state in Cu-intercalated Bi_2Se_3. I will also discuss combined ARPES and spectroscopic-imaging STM studies of doped Bi_2Te_3 and Bi_2Se_3 3D topological insulator systems.