Project title: **Tunning of the Rashba effect on silicon surface**

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Research project hypothesis and objectives

We propose a systematic study of the Rashba effect in one dimensional metallic structures on silicon surfaces. One dimensional structures will be prepared by the adsorption and/or formation of reconstructions by Bi and Pb atoms on vicinal and flat silicon substrates. We are going to investigate influence of different contributions:

1. atomic,
2. the in-plane anisotropy of the surface potential,
3. the asymmetry of the wave functions due to the buckling of the surface layer,

on a spin splitting and a spin texture of surface state bands.

In particular, we propose introduction of the additional in-plane component of the potential gradient, beside the eventually existing one due to a surface reconstruction, to the investigated systems. It can be done with vicinal surfaces which reveal regular distribution of monatomic steps. They introduce one dimensional periodic potential gradient across the surface whose periodicity can be tuned by a miscut angle. In addition, adsorption of Pb and/or Bi atoms will introduce atomic contribution - atoms with high Z number. Changes of a terrace width together with the modification of terraces by the adsorption or formation of reconstructions by Bi and/or Pb atoms will influence the in-plane potential gradient and anisotropy of the surface potential. It should also influence the buckling of the surface layer especially for very narrow terraces. Therefore, we expect significant changes in a spin structure of silicon surfaces.

The scientific goals of the project are:

a) determination of the magnitude of Rashba parameter and energy splitting of the Pb- and Bi-induced surface state bands,
b) determination of the influence of terrace width on a spin splitting and a spin texture of electronic bands,
c) determination of the influence of crystallographic structure, including the surface layer buckling, of the Pb- and Bi-induced structures on a spin splitting and a spin texture of electronic bands.