In-situ conductance of Fe/Si and Fe/Ge multilayers

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Ferromagnet/semiconductor heterostructures attract a lot of attention due to their potential application in spintronics [1, 2]. In this contribution we report study on Fe/Si and Fe/Ge multilayers (Mls) prepared at room temperature by magnetron sputtering onto oxidised Si substrates. In order to follow the influence on conductivity of particular sublayers, *in-situ* conductance measurements during the deposition were carried out. Fig. 1 exhibits an exemplary plot of conductance G *vs.* deposition time t of $[Fe(3\ nm)/Si(2.5\ nm)]_{15}$ + Fe(3 nm) Ml.

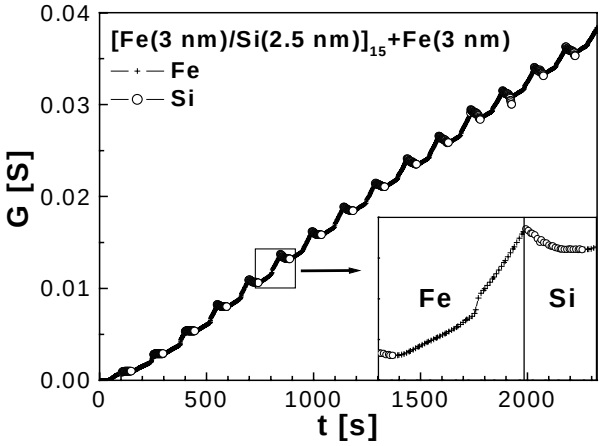

Fig. 1. Conductance G *vs.* deposition time t for Fe(3 nm)/Si(2.5 nm) Ml.

The plot consists of sections of different slopes of increasing and decreasing conductivity, corresponding to deposition of iron and silicon, respectively. The inset in Fig. 1 shows that the increase of G during Fe deposition is not uniform. It suggests the modification of iron growth mode or structural transition. During Si deposition onto Fe layer, the conductance initially decreases and then saturates. Such a behaviour can be explained as follows: at the beginning of Si deposition on Fe, Si diffuses into Fe, and a part of this layer is transformed into a low-conductive Fe-Si mixture. This process leads to the reduction of conductance of the bottom Fe layer. Subsequent Si deposition on the Fe-Si mixture leads to growth of nonconductive silicon, thus a G(t) plateau appears. Similar behaviour has been observed in Fe/Ge Mls.

[1] M. Kopcewicz, T. Luciński, P. Wandziuk, J. Magn. Magn. Mater. **286** (2005) 488
[2] P. Wandziuk, T. Luciński, M. Kopcewicz, Mater. Sci.-Poland **24** (2006) 861

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