Załącznik 2
do wniosku dr Tomasza Ślęzaka o przeprowadzenie postępowania habilitacyjnego

AUTOREFERAT
w języku angielskim

1. Name and surname: Tomasz Ślęzak

2. Degrees and titles:

   Master of Science in physics, Jagiellonian University, Kraków, 1995.

   PhD in Physics, Faculty of Physics and Nuclear Techniques, Stanisław Staszic University of Mining and Metallurgy, 2000.
   PhD thesis title „Spin Polarization and interlayer magnetic coupling in the Fe/FeAl/Fe and FeAu/Au/FeAu multilayers".

3. Professional Career

   1999-2000 - Faculty of Physics and Nuclear Techniques, AGH- University of Science and Technology, assistant,

   2000-till now - Faculty of Physics and Nuclear Techniques, AGH- University of Science and Technology, adjunct

4. a) As my scientific achievement for habilitation I indicate a collection of papers under a common title: „Magnetism and Lattice Dynamics of Fe Nanostructures Studied with Nuclear Resonant Scattering of X-rays", as listed below:

   1H. The influence of the interlayer exchange coupling on the magnetism of an Fe(001) monolayer
   T. Ślęzak, M. Ślęzak, K. Matlak, R. Rohlsberger, C. L'Abbe, R. Rüffer, N. Spiridis, M. Zając, J. Korecki
   Surface Science, 601(18) (2007) 4300

   2H. Phonons at the Fe(110) surface
   T. Ślęzak, J. Łażewski, S. Stankov, K. Parliński, R. Reitinger, M. Rennhofer, R. Rüffer, B. Sepioł, M. Ślęzak, N. Spiridis, M. Zając, A. I. Chumakov and J. Korecki
   Physical Review Letters, 99 (2007) 066103

   3H. Magnetism of ultra-thin iron films seen by the nuclear resonant scattering of synchrotron radiation
   T. Ślęzak, S. Stankov, M. Zając, M. Ślęzak, K. Matlak, N. Spiridis, B. Laenens, N. Planckaert, M. Rennhofer, K. Freindl, D. Wilgocka-Ślęzak, R. Rüffer and J. Korecki
   Materials Science-Poland, 26, No. 4, (2008) 885

   4H. Non-collinear magnetization structure at the thickness driven spin reorientation transition in epitaxial Fe films on W(110).
   T. Ślęzak, M. Ślęzak, M. Zając, K. Freindl, A. Kozioł-Rachwał, K. Matlak, N. Spiridis, D. Wilgocka-Ślęzak, E. Partyka-Jankowska, M. Rennhofer, A. I. Chumakov, S. Stankov, R. Rüffer and J. Korecki
   Phys. Rev. Let. 105 (2010) 027206

   5H. Different scenarios for the in-plane spin reorientation transition in Fe(110) films on W(110).
   T. Ślęzak, M. Zając, M. Ślęzak, K. Matlak, A. Kozioł-Rachwał, D. Wilgocka-Ślęzak, A.I. Chumakov, R. Rüffer, J. Korecki
   Phys. Rev. B 87 (2013) 094423

   6H. "Phonons in iron: from the bulk to an epitaxial monolayer"
   S. Stankov, R. Röhlsberger, T. Ślęzak, M. Sladecek, B. Sepioł, G. Vogl, A. I. Chumakov, R. Rüffer, N. Spiridis, J. Łażewski, K.Parliński, J. Korecki,
   Physical Review Letters, 99, (2007) 185501

   7H. An ultra-high vacuum system for in-situ studies of thin films and nanostructures by nuclear resonance scattering of synchrotron radiation
   S. Stankov, R. Rueffer, M. Sladecek, M. Rennhofer, B. Sepiol, G. Vogl, N.Spiridis, T. Ślęzak, J. Korecki
   Review of Scientific Instruments, 79 (2008) 045108

Declaration of co-authors indicating their contribution to the above papers and my estimation of my individual contribution are included in Attachments.

b) Description of the scientific achievement

Physics of nanostructures is in the last decades the field of intense theoretical and experimental research. The source of such strong interest in various nanostructures such as thin films and multilayers, nanowires and nanoparticles is driven not only by the fundamental interest but also potential applications in such fields as data storage industry, spintronics [1, 2] and modern heterogeneous catalysis [3]. Progress in nanophysics depend strongly on the development of experimental techniques that fulfill demanding requirements related to the typical properties of nanoobjects such as small amounts of materials deposited on massive substrates, large contribution of low-coordinated surface atoms, limited thermal stability influenced by the presence of interfaces and generally low free energy. In addition, studies of model nanostructures require ultrahigh vacuum environment (UHV) at the preparation and characterization stages. The collection of papers [1H-7H] demonstrate that unique methodology based on the combination of standard surface characterization techniques with the X-ray scattering methods at the third generation synchrotron source (ESRF) profits with a large number of results concerning magnetic properties and phonons of Fe nanostructures. The later approach allowed to achieve deeper insight into the magnetic properties of ultrathin Fe films on W(110) and enabled for the first time to experimentally determine modifications of the phonon density of states in ultrathin films and surface of Fe(110). The papers [1H, 3H-5H] are devoted to the magnetic properties of Fe films on W(110), whereas results concerning lattice dynamics of the Fe(110) surface and ultrathin Fe films are published in papers [2H, 6H]. The common feature of the above mentioned experiments is the application of the unique technique namely: nuclear resonant scattering of synchrotron radiation (NRS) [4], in its elastic variant (studies of magnetism) and in-elastic one (studies of lattice dynamics) in both cases, *in-situ* under UHV condition with use of the multichamber UHV system installed at the ID18 beamline of ESRF synchrotron. The capabilities of the mentioned UHV apparatus are described in details in paper [7H].

Supplementary studies were performed in laboratories of the Faculty of Physics and Applied Computer Science, AGH University of Science and Technology and Jerzy Haber Institute of Catalysis and Surface Chemistry Polish Academy of Sciences within a joint Surfaces and Nanostructures Laboratory led by prof. Józef Korecki. In the research numerous UHV surface preparation and characterization methods were used including molecular beam epitaxy (MBE), low energy electron diffraction (LEED), Auger electron spectroscopy (AES), also

scanning tunneling microscopy (STM), conversion electron Mössbauer spectroscopy (CEMS) and magnetooptic Kerr effect (MOKE).

The detailed description of the achievement will be given below in two parts dedicated to the studies of magnetic properties and lattice dynamics of Fe nanostructures respectively.

Magnetism of Fe nanostructures studied with nuclear resonant scattering of X-rays.

The interlayer exchange coupling (IEC) discovered in 1986 [5], is one of the most exciting phenomena observed in nano-layered magnetic materials. It was shown both experimentally and theoretically that in the trilayers composed of two ferromagnetic films (FM) separated with a nonmagnetic spacer (NM) the IEC oscillates between ferro- and antiferromagnetic type and its strength decays as the NM spacer thickness increases [5,6]. Whereas IEC nature and consequences, such as artificially structured ferro- or anti-ferromagnetism [7], giant magnetoresistance [8], etc., are rather well known and understood, the influence of the coupling on the collective magnetic properties of the whole multilayer system and its individual constituents is still not clear. In particular, for a trilayer system composed of two different ferromagnetic layers separated by a metallic, non-magnetic spacer , there are two important issues concerning the ferromagnetic sub-layers which are addressed experimentally [9], and theoretically [10], namely: (i) the existence of two different Curie temperatures in the exchange coupled FM1/NM/FM2 system and (ii) the IEC induced shift of the Curie temperature of the ferromagnetic sub-layers with respect to their uncoupled state value. The above phenomena can be favorably observed when the Curie temperature of one of the FM layers (in the uncoupled state) is much lower as compared to the other. This can be achieved by an appropriate choice of materials and their thicknesses as it was done, for example, for the Co/Cu/Ni trilayers [9].

In the paper [1H] the changes in the magnetic properties of a single Fe monolayer on Au(001) induced by the interlayer exchange coupling (IEC) to FeAu monoatomic superlattices were studied. The grazing incidence nuclear resonant scattering of X-rays combined with the ^{57}Fe probe layer concept allowed us to selectively monitor the local structure and magnetism of the Fe(001) monolayer in a coupled state. The dependence of the monolayer hyperfine parameters on temperature and spacer thickness was determined from the fitted NRS time spectra, collected for

the selected thickness of the stepped Au spacer. The influence of the coupling on the hyperfine magnetic field BHF was negligible at temperatures much lower than T_C of the uncoupled Fe monolayer (T_C = 210 K as checked by MOKE). The analysis of the time-spectra accumulated at 200 K showed a non-monotonous dependence of the average B_{HF} as a function of the spacer thickness, related to IEC oscillations. The negligible role of the coupling at low temperatures indicates that IEC effectively suppresses the spin fluctuations in the Fe(001) monolayer.

The spin reorientation transition (SRT), which consists of switching the spontaneous magnetization orientation between two directions in space, is one of the most important phenomena in the magnetism of nano-materials [11]. The SRT provides an opportunity to obtain a desired magnetization direction by adjusting the film thickness, temperature or coating material because in this way, the competition between various magnetic anisotropies, such as the shape, magnetocrystalline, magnetoelastic or surface anisotropy, can be adjusted. The importance and effectiveness of the SRT in controlling the magnetization direction has been demonstrated in numerous experiments, primarily in the case of polar SRT processes in which the spin orientation switches between the out-of-plane and an in-plane direction as the film thickness increases or the temperature changes [12,13].

In the Fe/W(110) system, the magnetization direction switches from the [1-10] to the [001] in-plane direction during the film growth process as the thickness of the iron film approaches a critical thickness, d_c. The are two early and contradictory explanations of this SRT process, namely: historically first one assuming the key role of magnetic surface anisotropy [14,15] and the other based on the evolution of the magnetoelastic anisotropy [16]. It has to be noted that for the Fe thicknesses that are close to the critical thickness of the SRT process the magnetization reorientation can be also induced by the change of temperature [17]. One of the fundamental problems for characterizing the SRT process is determining the route in which this transition proceeds. Knowledge about the magnetization reorientation process not only provides deeper insight into the physics of the SRT by indicating its discontinuous (first-order) or continuous (second-order) character but also, in many cases, highlights the role of specific magnetic anisotropy contributions. The three classes of the SRT scenarios have been theoretically predicted and experimentally confirmed, including the formation of magnetic domains, coherent magnetization rotation and the formation of a vertical or lateral non-collinear magnetic structure

[18]. While the first two mentioned possibilities assume a homogenous magnetization along the film normal, the third one allows for finite differences between the magnetization directions of the neighboring atomic sublayers that may lead to the formation of a planar Bloch-like domain wall. In case of Fe/W(110) the formation of magnetic domains with the orthogonal magnetization near the critical thickness was indirectly concluded from the existing experimental data [19,20].

In papers [3H,4H], the true nature of the room temperature (RT) in-plane SRT from the [1-10] to the [001] direction was revealed in-situ with nuclear resonant scattering of X-rays. The numerical analysis of the NRS data indicated that a non-collinear magnetization structure is formed in the vicinity of the critical thickness, with a strong surface magnetization pinning along the [1-10] direction. With increasing thickness, the transition is initiated at the bottom atomic layers, neighboring with the tungsten substrate, and finally is completed at the surface layer. This result indicates that a strong surface anisotropy pins the magnetization to the [1-10] direction, whereas the SRT itself can be attributed to the changes of the strain-induced magnetoelastic anisotropy that evolve with the thickness during the growth of the film. Therefore, at the vicinity of the critical thickness, a vertical non-collinear magnetic state exists with a large spread of the magnetization orientation at the film surface and at the Fe/W interface similar to the Fe exchange spring structure reported in [21]. This behavior cannot be treated within the common phenomenological description of the SRT that is based on the separation of the total magnetic anisotropy into the surface and volume contributions, which works for the homogenous magnetization approximation, but exceptionally, the role of particular magnetic anisotropy contributions in the magnetic reorientation could be identified. It is especially convincing that the details of the transition predominantly depend on the stress-strain structure assisted by a contribution of the magnetic surface anisotropy. The fact that the SRT process is initiated at the bottom of the Fe film points to the conclusion that most probably magnetoelastic anisotropy at the vicinity of the Fe/W(110) interface evolves during the film growth with the increasing thickness in such a way that the easy magnetization direction of the bottom part of the film changes from the [1-10] to the [001] direction. The experiment then explains the apparent contradiction concerning the decisive factor for the magnetic anisotropy in the Fe(110)/W system. A strong surface anisotropy pins the magnetization to the [1-10] direction, as postulated by Gradmann et al. [14], while the SRT itself can be attributed to the changes of strain-induced magnetoelastic anisotropy evolving with the thickness during the film growth, in agreement with

the interpretation of Sander et al. [16]. In fact, both magnetic surface anisotropy and magnetoelastic anisotropy are responsible for the transition, as they become competing at the vicinity of the critical thickness only, while for the lower thickness they can cooperatively favor the [1-10] magnetization direction. The main results of paper [4H] were also published in the ESRF Highlights 2010 (copy attached).

The above results implied an immediate question concerning the scenario of the other possible SRT processes for Fe/W(110), such as a thickness-induced transition at elevated temperatures and a temperature-induced transition, at which the structure of the film can evolve due to the thermal relaxation of the film that accompanies the transition. The paper [5H] reports on investigations of these two issues with the use of in-situ nuclear resonant scattering (NRS) of synchrotron radiation. Compared to NRS investigation of the thickness-induced SRT at RT [4H], an enhancement of the NRS depth sensitivity by varying the grazing incidence angle was explored. It was shown that the thickness-induced SRT process at 250°C also proceeds through an intermediate, vertical non-collinear magnetic state, but in contrast to the RT thickness-driven reorientation, the sequence of sublayer magnetization switching is opposite, namely with the increasing thickness, the magnetization reorientation from the [1-10] to [001] direction is initiated at the surface atomic layers and completed at the Fe/W(110) interface. The temperature-induced SRT could be observed as the sample temperature was decreased after completion of the thickness-driven SRT at 250°C. In this case, the scenario of the magnetization switching from the [001] magnetized state at 250°C to the [1-10] magnetization orientation at 160°C is similar to the thickness-driven SRT; the intermediate magnetic structure at 215°C is strongly non-collinear with the top-most layers magnetized along the [001] direction and the bottom ones reoriented to the [1-10] direction. In addition, upon the subsequent temperature increase to the 250°C, the irreversibility of the SRT transition could be observed, which was most likely due to residual gas adsorption [19]. Despite the complexity of the SRT mechanisms, an exotic non-collinear spin structure at the SRT process appears to be its general feature. Explaining this feature using the bulk Fe material parameters, such as the exchange stiffness, A, and the magnetocrystalline anisotropy constant, K, is not possible. The observed magnetization fanning results in the increase of the free energy density, ΔE_{ex}, related to the exchange interaction that prefers a ferromagnetic spin alignment. ΔE_{ex} corresponding to the orthogonal sublayer magnetization orientation realized over the distance comparable to approximately 3 nm (vertical fanning depth)

can be roughly estimated as A/3 nm. Assuming the bulk value of A~2.8×10^6 erg/cm, one ends up with the $\Delta E_{ex} \sim 10$ erg/cm^2. ΔE_{ex} must be compensated by a decrease of the magnetic anisotropy energy of the bottom part of the film dominated by the magnetoelastic contribution. This result indicates a large change of the magnetoelastic anisotropy energy (per unit area) contribution that is involved in the SRT process. However, even the highest reported uniaxial magnetoelastic anisotropy energy, yields for the Fe(110) film with a thickness of D=6 nm the surface energy density of $K_u d \sim 0.5$ erg/cm^2 that can be attributed to the magnetoelastic effects, which is considerably less than the estimated ΔE_{ex}. This result suggests that not only enhanced anisotropies but also a softening of the exchange interaction must be present in the discussed Fe films, which are related to the: i) increased temperature, ii) lattice expansion [22] or iii) dislocation-induced stacking faults.

The experiments described above deliver not only the unique picture of the SRT process in Fe/W(110) system, but report on a new class of SRTs that can be found in other nanostructures.

Lattice dynamics of Fe nanostructures studied with in-elastic nuclear resonant X-ray scattering (NIS)

The fascinating development of nanoscale science requires a precise understanding of dynamical and thermodynamical properties of surfaces and nano-objects. The information about elastic parameters such as force constants, mean square displacement, as well as thermodynamic like entropy are embedded in the phonon density of states (PDOS). PDOS can obtained theoretically [23] but its direct measurements for the clean, well defined surfaces was not possible for a long time. Recent developments at the beamline ID18 of ESRF synchrotron have enabled the phonon spectroscopy of monolayer films and nanostructures using *in situ* nuclear inelastic scattering (NIS) [7H]. The method gives phonon PDOS which is (i) partial -only atoms of the resonant isotope contribute- and (ii) projected onto the direction of the incident photons.

In the papers [2H, 6H] by measuring the PDOS, in-situ under UHV conditions the following questions have been addressed. What are the surface modifications of the phonon dynamics with respect to the bulk? How “thick” from the thermodynamical point of view is a

surface? What changes in the vibrational properties are induced due to the lowered Fe system dimensionality?

In paper [2H] the first two of the above mentioned questions were addressed. The phonon DOS for single atomic monolayers at and near a clean Fe(110) surface at room temperature. The samples were single crystalline Fe(110) films epitaxial grown on W(110) crystal, where the chosen atomic monolayers were filled with the resonant ^{57}Fe isotope, while the rest of the film was composed of the non-resonant ^{56}Fe atoms. Using a special preparation protocol, the ^{57}Fe monolayers could be precisely located at the surface, one atomic layer below the surface and deeper. Due to the ideal isotope selectivity of nuclear resonant scattering, this approach gives the resolution of a single atomic layer in a chemically homogeneous crystal. Moreover, a combination of the grazing incidence coherent nuclear scattering (NRS) and incoherent NIS provided the direct correlation between electronic(including magnetic) and phononic properties. The PDOS of the first surface monolayer is very different from those of two other samples, as well as from the DOS of the bulk iron. The results show that atoms of the first layer vibrate with frequencies significantly lower and amplitudes much larger than those in the bulk. The most striking anomalies are the suppression of the phonon peak at 35 meV and a considerable enhancement of vibrational states below 15 meV. The observed anomalies of atomic dynamics are strongly localized within the first atomic monolayer. Already in the second atomic layer most of the bulk DOS features are restored and the deeper layers display truly bulk behavior. This striking observation indicates that thermodynamically the surface is only one monolayer thick.

Similar modification of the vibrational properties as at Fe surface are expected in the Fe nanostructures such as ultrathin films due to its lowered dimensionality. In paper [6H] a results of systematic NIS measurements of the PDOS as a function of the Fe film thickness starting from relatively thick films (about 40 monolayers thick) down to a single Fe monolayer on W(110) are reported. The DOS of the 10 and 40 ML films resemble closely the DOS of bulk Fe but the spectral features are shifted to slightly lower values. This can be attributed to the expanded state of the Fe film that results from the mismatch of the W and Fe lattices and goes along with a lattice volume expansion of about 2%. In addition, for the 10 ML film one observes a pronounced increase of the DOS at low energies. With decreasing thickness one observes a further increase of low-energy modes while spectral features at high energies are significantly reduced. The clear softening of the modes is caused by a decrease of the coordination number at the surface and is

typical for surface phonons [2H], but certainly also mirrors the coupling of the adsorbed iron atoms to the tungsten substrate. Moreover, spectral features seem to become significantly broader with decreasing thickness. Most probably, this results from the distribution of force constants in the strain field that is due to the large lattice misfit towards the substrate. Particular emphasis should be directed to the DOS of the epitaxial monolayer Fe on W(110) that basically reflects the local vibrational properties of the Fe atoms at the regular adsorption sites on the W(110) surface. It has to be noted that already successful measurements of PDOS for a monolayer is a unique experimental achievement. The detailed analysis of the PDOS as a function of Fe thickness allowed to formulate an intriguing conclusion that PDOS spectrum for the film with given thickness can be decomposed into the three contributions i) surface contribution, ii) contribution of Fe atoms vibrating at the interface with W(110) and iii) volume bulk-like contribution attributed to vibrations of internal Fe atoms which interestingly well agrees with bulk PDOS spectrum. This important result means that even for the Fe film that is three monolayer thick, the atoms of the surface layer and atoms at the interface with the tungsten substrate vibrate with the lower frequencies and higher amplitudes while atoms of the internal atomic layer reveal dynamics of bulk Fe. Accordingly, as a truly two-dimensional system only a Fe monolayer can be regarded, while even slightly thicker films are dominated by the short range influence of surfaces and interfaces.

References

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5. Other scientific achievements

In 1995, after completion of master studies in physics at the Faculty of Mathematics and Physics of the Jagiellonian University I undertook the PhD studies at the research group of prof. Józef Korecki, in the Department of Solid State Physics at the Faculty of Metallurgy and

Materials Science AGH, now part of Faculty of Physics and Applied Computer Science AGH. I followed the scientific interest of the group at that time namely: magnetic properties of ultrathin films and multilayers. In particular, the most intensive research activity was devoted to the preparation, structural and magnetic characterization of epitaxial multilayers with a monoatomic FeX (X=Al,Au) superlattices as key-element. In case of the Fe/FeAl/Fe trilayers the origin of the interlayer magnetic coupling was explained and influence of the magnetic coupling on the spin polarization in the FeAl spacer was studied [D2]. In case of FeAu/Au/FeAu trilayer, it was found that FeAu sublayers with perpendicular magnetic anisotropy [D1] are exchange coupled across the Au spacer [D7]. I defended with distinction my PhD thesis entitled „Spin Polarization and Interlayer magnetic coupling in the Fe/FeAl/Fe and FeAu/Au/FeAu multilayers" in 2000 under supervision of prof. Józef Korecki. The most important achievements of my scientific activity before receiving PhD degree is summarized in the papers listed below.

[D1] Structural and magnetic properties of monoatomic FeAu superlattices
T.Ślęzak, W. Karas, M. Kubik, M. Mohsen, M. Przybylski, N. Spiridis, J. Korecki
Hyperfine Interactions (C), 3 (1998) 409

[D2] Indirect exchange coupling and spin polarization in Fe/AlFe/Fe trilayers
T. Ślęzak, M. Kubik, J. Korecki
Journal of Magnetism and Magnetic Materials, 198-199 (1999) 405

[D3] Magneto-Optical Anisotropy Study in Fe n/Au n Superlattices.
L. Uba, S. Uba, V.N. Antonov, A.N. Yaresko, T. Ślęzak, J. Korecki
Physical Review B, 62 (2000) 13731

[D4] Magneto-Optical Anisotropy Study in Fe/Au monoatomic multilayer
L. Uba, S. Uba, V.N. Antonov, A.N. Yaresko, A. Ya. Perlov, T. Ślęzak, J. Korecki
Solid State Communication 114 (2000) 441-445

In the second half of 2000, I started the one year-long post doctoral activity at the "Instituut voor Kern- en Stralingsfysica", embedded in the Department of Physics and Astronomy, of the Faculty

of Science of K.U.Leuven in Belgium. During my stay in Belgium I was scientifically focused on the preparation and magnetic characterization of epitaxial multilayers which due to the special magnetic anisotropy engineering combined with interlayer exchange coupling displayed artificial non-collinear magnetic ordering [D8].

Since 2001 I have been continuing work at the group of prof. Józef Korecki. The scientific area covers wide range of properties of nanostructures with a special impact on the magnetic and dynamical properties low dimensional materials. In particular the subject of the studies were such magnetic properties of thin films and multilayers as interlayer exchange coupling in following epitaxial trilayers: Fe/Cr/Fe [D6], Fe/Ag/Fe [D9], Fe/FeAl/Fe [D11], FeAu/Au/FeAu [D7] and perpendicular magnetic anisotropy in ultrathin Fe films on a following substrates Au(001) [D5, D13], MgO(001) [D15], W(110) [D14] and W(540) [D12]. Accordingly, the output of my work in the field of magnetism (excluding the habilitation achievement mentioned in the paragraph 4 of this document) is best expressed via the contribution to the following papers:

[D5] CEMS studies of Au/Fe/Au ultrathin films and monoatomic multilayers
W. Karaś, B. Handke, K. Krop, M. Kubik, T. Ślęzak, N. Spiridis, D. Wilgocka-Ślęzak, J. Korecki
Phys. Stat. Sol. (a) vol 189, No. 2/3 (2002)

[D6] Interface structure and indirect coupling in annealed Fe/Cr/Fe ultrathin films
M. Kubik, B. Handke, W. Karaś, N. Spiridis, T. Ślęzak, J. Korecki
Phys. Stat. Sol. (a) vol 189, No. 2/3 (2002)

[D7] Spin engineering with FeAu monolayers
T. Ślezak, W. Karaś, K. Krop, M. Kubik, D. Wilgocka-Ślęzak, N. Spiridis, J.Korecki
J. Magn. Magn. Mat. 240 (2002) 362-364

[D8] Experimental studies of the non-collinear magnetic states in epitaxial FeAu multilayers
D. Wilgocka-Ślęzak, T.Ślęzak, B.Croonenborghs, M.Rots, W.Karaś, K. Krop, N. Spiridis, J.Korecki
J. Magn. Magn. Mat. 240 (2002) 536-538

[D9] Direct observation of the conduction electron spin polarization in the Ag spacer of a Fe/Ag/Fe trilayer
H. Luetkens, J. Korecki, E. Morenzoni, T. Prokscha, M. Birke, H. Glückler, R. Khasanov, H.-H. Klauss, T. Slezak, A. Suter, E.M. Forgan, Ch. Niedermayer, F. J. Litterst,
Phys. Rev. Lett. vol.91, no.1, (2003), 017204/1-4

[D10] Observation of the domain structure in Fe-Au superlattices with perpendicular anisotropy,
M. Żołądź, T. Ślęzak, D. Wilgocka- Ślęzak, N. Spiridis, J. Korecki, T. Stobiecki, K. Röll
Journal of Magnetism and Magnetic Materials, Volume: 272-276, Part 2, May, 2004, pp. 1253-1254

[D11] Spin polarization and interlayer coupling in Fe/FeAl/Fe sandwiches,
T. Ślęzak, D. Wilgocka- Ślęzak, N. Spiridis, J. Meersschaut, J. Korecki
Journal of Magnetism and Magnetic Materials, Volume: 272-276, Supplement, May, 2004, pp. E971-E972

[D12] Tailoring of the perpendicular magnetization component in ferromagnetic films on a vicinal substrate
A. Stupakiewicz, A. Maziewski, K. Matlak, N. Spiridis, M. Ślęzak, T. Ślęzak, M. Zając, and J. Korecki,
Physical Review Letters, 101 (2008) 217202

[D13] Thickness-Driven Polar Spin Reorientation Transition in Ultrathin Fe/Au(001) Films
D. Wilgocka-Ślęzak, K. Freindl, A. Kozioł, K. Matlak, M. Rams, N. Spiridis, M. Ślęzak, T.Ślęzak, M. Zając, J. Korecki,
Physical Review B, 81 (2010) 064421

[D14] Perpendicular magnetic anisotropy and noncollinear magnetic structure in ultrathin Fe films on W(110).

M. Ślęzak, T. Ślęzak, K. Freindl, W. Kara , N. Spiridis, M. Zając, A. I. Chumakov, S. Stankov, R. Rüffer, J. Korecki
Phys. Rev. B, 87 (2013) 134411

[D15] Magnetism of ultrathin Fe films in MgO/Fe/MgO in epitaxial structures probed by nuclear resonant scattering of synchrotron radiation.
A. Kozioł-Rachwał, T. Giela, B. Matlak, K. Matlak, M. Ślęzak, T. Ślęzak, M. Zając, R. Rüffer, and J. Korecki
Journal of Applied Physics 113 (2013) 214309

The remaining, most important scientific achievements concerned stabilization of bcc cobalt films on Au(001) substrate [D16] and series of papers dedicated to the process of diffusion and structural dynamics of Fe(110) monolayer on W(110) [D17-D19]. The output of this activity is expressed in the contribution to the following papers:

[D16] Ultrathin epitaxial bcc-Co films stabilized on Au(001)-hex
N. Spiridis, T. Ślęzak, M. Zając, J. Korecki
Surface Science, 566-568P1 (2004) 272-277

[D17] Dynamics in sub-monolayer Fe-films
M. Sladecek, B. Sepiol, J. Korecki, T. Slezak, R. Rüffer, D. Kmiec, G. Vogl
Surface Science, 566-568P1 (2004) 372-376

[D18] Hyperfine relaxation in an iron sub-monolayer
M. Sladecek, B. Sepiol, D. Kmiec, J. Korecki, T. Slezak, R. Rüffer and G. Vogl,
Defect and Diffusion Forum, 237-240 (2005) 1225.

[D19]Nuclear resonant scattering studies of electric field gradient in Fe monolayer on W(110)
E. Partyka-Jankowska, B. Sepiol, M. Sladecek, D. Kmiec, J. Korecki, T. Ślęzak, M. Zając, S. Stankov, R. Rüffer, G. Vogl

Surface Science, 602 7 (2008) 1453-1457

The complete list of publications with the description of my individual contribution can be found in the attachment: “Wykaz_dorobku_tslezak”

Kraków 05.09.2013 Tomasz Ślęzak