GLOSSARY OF NANOTECHNOLOGY

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Foreword

Nanotechnology is science, engineering, and new technology conducted at the nanoscale, which is about 1 to 100 nanometers. In fact , nanotechnology ("nanotech") is manipulation of matter on an atomic, molecular, and supramolecular scale. It's hard to imagine just how small nanotechnology is. One nanometer is a billionth of a meter, or 10^{-9} of a meter. Nanoscience and nanotechnology involve the ability to see and to control individual atoms and molecules. Everything on Earth is made up of atoms—the food we eat, the clothes we wear, the buildings and houses we live in, and our own bodies. Although modern nanoscience and nanotechnology are quite new, nanoscale materials were used for centuries. Today's scientists and engineers are finding a wide variety of ways to deliberately make materials at the nanoscale to take advantage of their enhanced properties such as higher strength, lighter weight, increased control of light spectrum, and greater chemical reactivity than their larger-scale counterparts.

Then, Since nanotechnology is a new interdisciplinary field in the world, those interested in this series are still not familiar with the terminology and its content.

Because, nanotechnology terminology in all countries, especially in our country, Iran, use alike for scientists and researchers, we decided to collect a series of nano terms in the form of a comprehensive encyclopedia or glossary. We want to translate this collection into Farsi in the near future. We hope this unique collection for all fans of the series, will be useful. Because each set is collected, is not bug-free this collection definitely will not be bug-free. Because each set is collected, is not bug-free, this collection definitely will not be bug-free. So, dear readers, we request you to improve the next edition, Notify us of your suggestions and criticisms.

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Symbols

ΔE	E the ΔE effect, defined as the fractional difference between E_M and E_H
Δf	resonant frequency shift
Δm	variation of mass
ΔV	volume of the liquid trapped in the ferromagnetic glass surface
Δx	change of magnetic susceptibility
$\Delta \varepsilon$	change of applied strain
μ	magnetic permeability
μ_0	magnetic permeability in vacuum
μ_m	magnetic moment
μ_r	relative magnetic permeability
μ_t	transverse permeability of the ferromagnetic glass ribbon
μ_θ	circumferential permeability of the ferromagnetic glass wire
a	radius of the ferromagnetic glass wire
a	The normalized column separation as determined by Tait's rule.
B_r	remanence
B_s	saturation induction
C	Curie constant
d	thickness of the ferromagnetic glass ribbon
D	electric flux density
[illegible]	The "average" separation of randomly grown GLAD columns.
E_C	Young's modulus of the ferromagnetic glass coating at a constant applied field
E_{ex}	exchange energy
E_H, E_S	Young's modulus of the ferromagnetic glass ribbon at a constant applied field.
E_M	Young's modulus of the ferromagnetic glass ribbon at a constant magnetization
F	figure of merit
f_n	nth harmonic resonant frequency of a vibrating

	ferromagnetic glass sensor
f_t	resonant frequency of a ferromagnetic glass ribbon after applying a thin coating
GMI%	giant magnetoimpedance ratio
H, H_{appl}	applied magnetic field
H_c	coercive force
H_d	demagnetizing field
H_i	internal magnetic field
H_k	anisotropy field
H_{max}	saturation magnetic field
I	electric current
j	complex number
J_c	conduction current
J_{ex}	exchange integral
k	effective magnetoelastic coupling
K	anisotropy constant
k_B	Boltzmann constant
K_U	anisotropy energy
L	length of the ferromagnetic glass sensor
M	magnetization
m_0	mass of the ferromagnetic glass sensor
M_s	saturation magnetization
m_t	mass of the ferromagnetic glass sensor after applying a thin coating
N, N_d	demagnetization factor
p	The period of seed elements used to grow periodic GLAD structures.
p	Thin film density.
p_c	Ambient chamber pressure. For evaporation, pc is less than 10^{-5}Torr (10^{-3}Pa) and typically on theorder of 10^{-6} Torr (10^{-4} Pa) for refractory metals. For sputtering, is on the order of 10^{-3} to 10^{-2} Torr (0.1 to 1.0 Pa).
p_c	density of the coating material of the ferromagnetic glass sensor
p_e	electrical resistivity
p_{es}	surface charge density
p_l	liquid density

p_m	Coulomb magnetic moment
p_s	density of the ferromagnetic glass sensor
q_e	electric charge
Qm	Coulomb magnetic pole strength
R_{dc}	dc electrical resistance
s	electron spin
s	The diameter of columns grown using the GLAD technique.
β	Columnar angle measured relative to the substrate normal.
t	The thickness (i.e., height) of individual seed elements used to grow periodic GLAD structures. This parameter, coupled with the flux incidence angle, helps determine the optimal seed period.
T	temperature, torque
T	Substrate or film surface temperature.
T_c	crystallization temperature
T_m	Melting temperature of source material.
T_θ	Curie temperature
u_a	anisotropy energy
u_{el}	elastic energy
$u_{m\ell}$	magnetoelastic energy
u_x	displacement of a vibrating ferromagnetic glass sensor
v	velocity
$V, V1, V2$	measured voltage across the length of the ferromagnetic glass sensor
w	width of the ferromagnetic glass ribbon
[illegible]	magnetic susceptibility
[illegible]	magnetic susceptibility of a ferromagneticglass sensor at zero applied stress
Z	electrical impedance
α	directional cosines of magnetization
α	The angle of incident flux at the substrate measured relative to the substrate normal.
α	directional cosines of magnetization
γ	Weiss constant
δ	domain wall thickness

	periodic GLAD structures. At this period, film growth occurs only at the locations of seed elements. In other words, $\delta \equiv p$ optimized.
$\Delta\alpha$	A measure of the angular distribution in flux incident at the substrate.
ε	magnetostrictive strain
η_l	liquid viscosity
λ_s	magnetostriction constant
σ	applied stress
σ_p	Poisson's ratio
φ	Rotation angle about an axis located at the substrate center, and parallel to its normal.
χ_c	Columnar angle measured relative to the substrate plane.
χ_v	The angle of incident flux measured relative to the substrate plane.
ω	radian frequency