

SURFACE ACOUSTIC WAVE (SAW)- SURFACE PLASMON RESONANCE (SPR) MICROFLUIDIC BIOSENSOR FOR REAL-TIME MONITORING AND ENHANCEMENT OF CHEMICAL FUNCTIONALIZATION OF GOLD FILMS

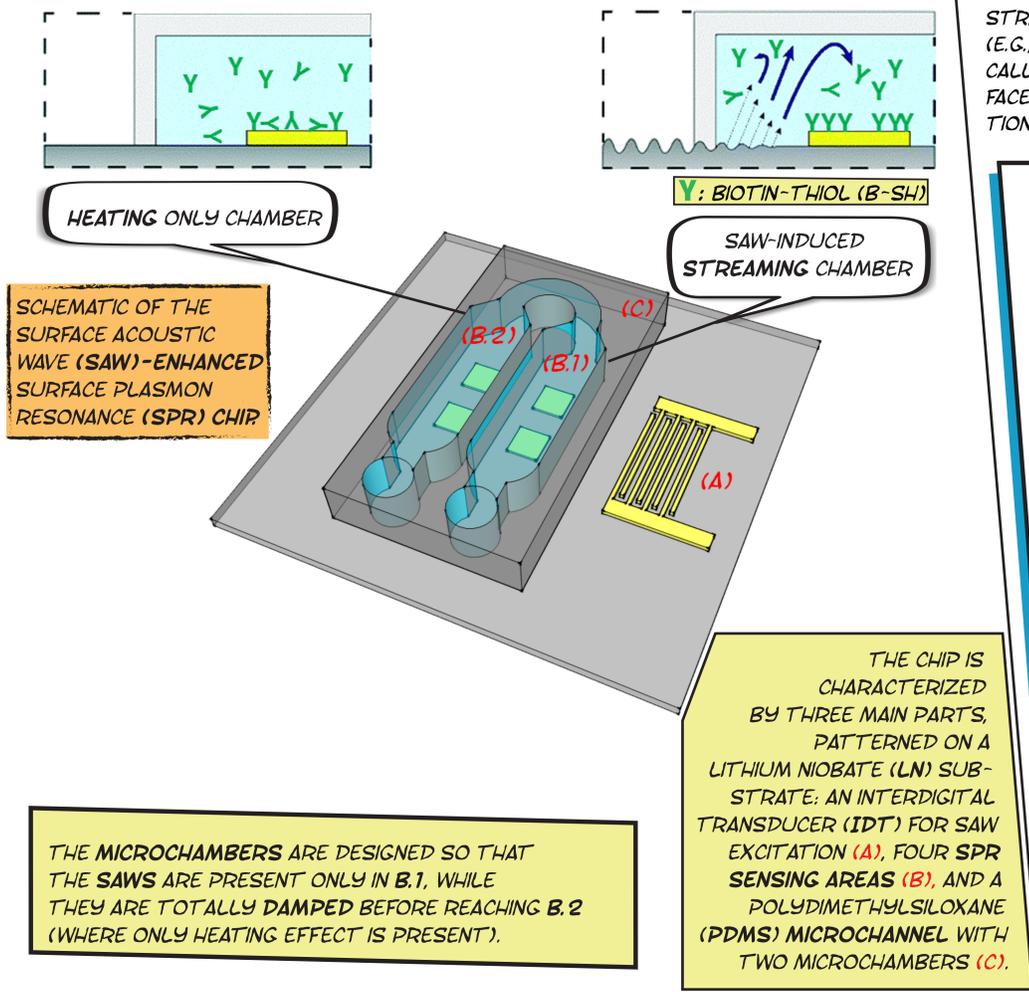
G. GRECO^{A,*}, M. AGOSTINI^{A,B}, A. SONATO^C, R. SHILTON^B, M. TRAVAGLIATI^{A,B}, G. SIGNORE^{A,B}, G. RUFFATO^D, E. GAZZOLA^D, F. ROMANATO^{C,D} AND M. CECCHINI^A

^A NEST, ISTITUTO NANOSCIENZE-CNR AND SCUOLA NORMALE SUPERIORE, PIAZZA SAN SILVESTRO 12, 56127 PISA, ITALY
^B CENTER FOR NANOTECHNOLOGY INNOVATION @ NEST, ISTITUTO ITALIANO DI TECNOLOGIA, PIAZZA SAN SILVESTRO 12, 56127 PISA, ITALY
^C CNR-IOM, AREA SCIENCE PARK, S.S. 14, KM 163.5, 34149, BASOVIZZA (TS), ITALY
^D DEPARTMENT OF PHYSICS AND ASTRONOMY, UNIVERSITY OF PADOVA, VIA MARZOLO 8, 35131 PADOVA, ITALY

ABSTRACT

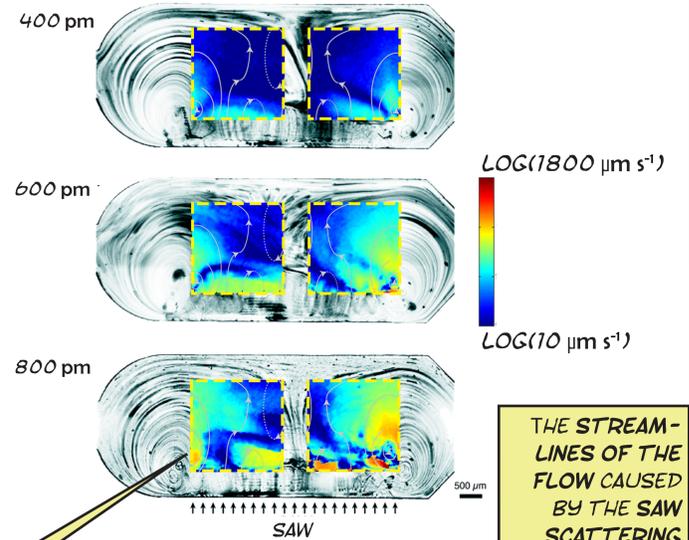
SURFACE BIOCHEMICAL FUNCTIONALIZATION IS A FUNDAMENTAL PROCESS THAT IS WIDELY APPLIED IN MANY FIELDS TO ADD NEW FUNCTIONS, FEATURES, OR CAPABILITIES TO A MATERIAL'S SURFACE. ONE OF THE MOST COMMON SURFACE IS GOLD, PARTICULARLY FOR BIOSENSING APPLICATIONS. A VARIETY OF FUNCTIONALIZATION STRATEGIES FOR GOLD FILMS ARE CURRENTLY AVAILABLE BUT THEIR OPTIMIZATION (E.G., IMPROVED ANTIFOULING OR BIO-RECOGNITION ELEMENT ORIENTATION) TYPICALLY REQUIRES COMPLEX OR EXPENSIVE STRATEGIES. HERE WE PRESENT A SURFACE ACOUSTIC WAVE (SAW)-BASED TECHNIQUE TO IMPROVE THE FUNCTIONALIZATION OF GOLD FILMS IN A MICROFLUIDIC ENVIRONMENT.

THE BIOSENSOR



FLUID DYNAMICS

SAW-INDUCED STREAMING CHARACTERIZATION FOR DIFFERENT WAVE AMPLITUDES.

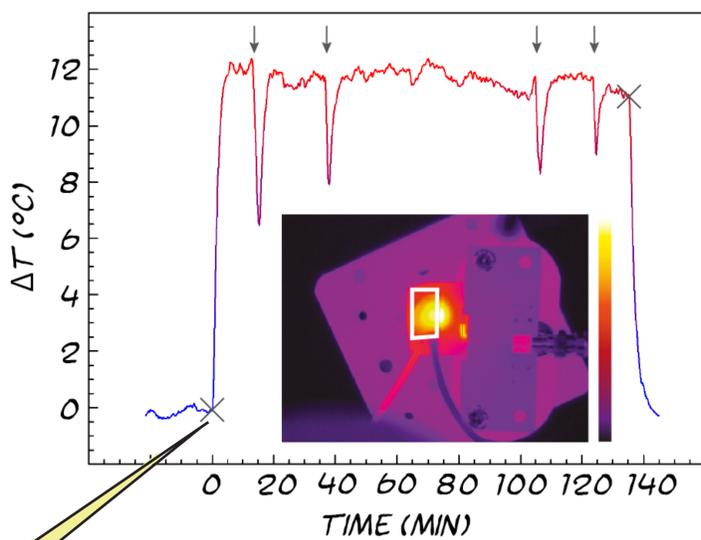


THE μPIV VELOCITY FIELDS ON THE TWO GOLD SPR AREAS ARE SUPERIMPOSED TO THE STREAMLINES.

THERMAL CHARACTERIZATION

THERMAL MEASUREMENTS IN THE PRESENCE OF SAWS.

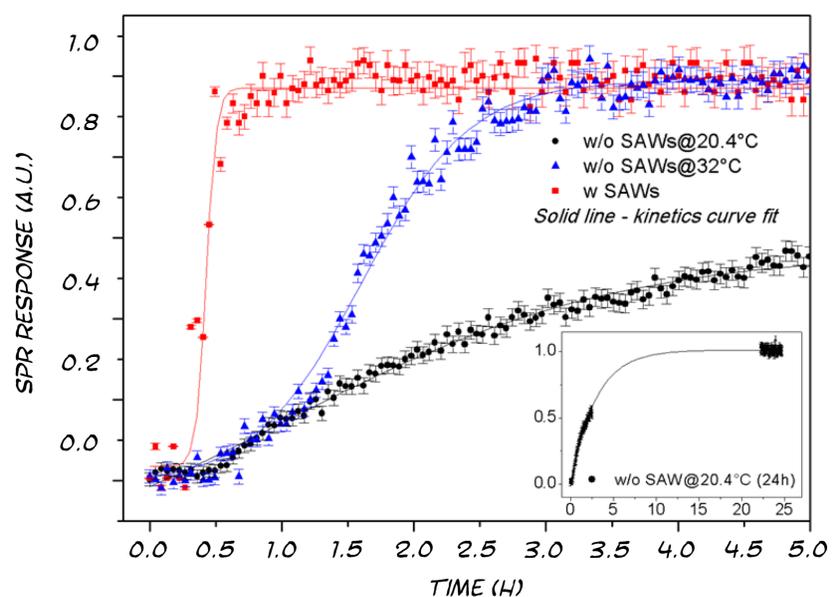
THE ACTIVATION OF SAWS ALSO DETERMINES THE HEATING OF THE SAMPLE, THROUGH THE JOULE EFFECT IN THE IDT AND SAW VISCOUS DISSIPATION INTO BOTH THE PDMS AND LIQUID.



RESULTS

COMPARISON BETWEEN BIOTIN-PEG2KDA-SH ADSORPTION KINETICS DURING 3 HOURS OF PEG INCUBATION OBTAINED UNDER THE THREE EXPERIMENTAL CONDITIONS: WITH SAWS; WITHOUT SAWS @20.4°C AND @32°C (CONTROL).

IN THE INSET, PEG ADSORPTION KINETICS W/O SAWS@20.4 °C IS SHOWN IN A 24 H INTERVAL



SAW-INDUCED FUNCTIONALIZATION ENHANCEMENT
82% SATURATION TIME REDUCTION

