1. **Name:** Rapid curing and self-stratifying lacquer coating with antifouling and anticorrosive properties  
**Authors:** Yuxian Chen a, Guoliang Zhang a,b, Guangzhao Zhang, Chunfeng Ma  
**Journal:** Chemical Engineering Journal  
**DOI:** 10.1016/j.cej.2021.129755  
**Abstract:** Natural lacquers have long been used as environment-friendly and renewable coatings. Generally, they dry slowly and do not have fouling resistance limiting their applications. Herein, we report a rapid curing, self-stratifying amphiphilic hybrid lacquer coating with excellent antifouling and anticorrosive properties. The coating was prepared by using a natural lacquer coupled with hyperbranched polysiloxane terminated by multi-amine (HPSi) and silane-terminated amphiphilic telomer (S-FP) through a facile sol–gel process. The introduction of HPSi greatly shortened the drying time and improved the mechanical properties of the natural lacquer coating. As HPSi content increased, the drying speed and surface hardness of the coating increased. Particularly, the incorporation of a non-leaching, self-enriched amphiphilic telomer into the hybrid lacquer conferred it an excellent antifouling performance but preserved its anticorrosive and mechanical properties. The flexibility and bacteria-resistant ability of the coating were significantly improved with S-FP content. The study provides a new strategy for modification of natural lacquer, and the hybrid lacquers are expected to be used in development of coatings with both antifouling and anticorrosive performance.  

2. **Name:** Incorporation of simvastatin into lipid membranes: Why deliver a statin in form of inclusion complex with hydrophilic cyclodextrin  
**Authors:** Aleksandra Bartkowiak, Dorota Matyszewska, Agata Krzak, Michalina Zaborowska, Marcin Broniatowski, Renata Bilewicz  
**Journal:** Colloids and Surfaces B: Biointerfaces  
**DOI:** 10.1016/j.colsurfb.2021.111784  
**Abstract:** In this work, the effects of simvastatin (SIM), 2-hydroxypropyl)-β-cyclodextrin (HPβCD) and their complex (SIM: HPβCD) on the structure and properties of lipid membranes were investigated for the first time by Langmuir technique combined with PM-IRRAS spectroscopy. An improved understanding of the differences of the interactions between free SIM, and SIM in the form of an inclusion complex with HPβCD with the lipid membrane will improve the development of preparation methods for in vivo applications. Monolayers of 1,2-dimyristoyl-sn-glycero-3-phosphocholine (DMPC), cholesterol (Chol) and their mixture DMPC:Chol (7:3) served as simple models of one leaflet of the cell membrane. The penetration of well-organized lipid layers by simvastatin lead to their fluidization but the extent of this unwanted effect was smaller when the drug was delivered in the form of the SIM:HPβCD complex. Surface pressure vs. time dependencies showed that the drug encapsulated with cyclodextrin dissociated from the complex upon contact with the lipid layer and the weak
interactions between the exterior polar part of the HPβCD and the polar headgroups of the lipid layer facilitated smooth incorporation of the released lipophilic drug into the membrane. At a longer time-scale, the HPβCD ligand released from the complex removed some cholesterol, but not DMPC, from the lipid layer, hence, similarly to the enzyme inhibiting action of statins – it lead to the decrease of the amount of cholesterol in the membrane. Delivery of simvastatin in the form of an inclusion complex with HPβCD is proposed as an approach improving its bioavailability in the cholesterol-lowering therapies

Link: https://www.sciencedirect.com/science/article/pii/S0927776521002289

3. Name: Characterization of magnesium doped sol-gel biomaterial for bone tissue regeneration:

   The effect of Mg ion in protein adsorption

   Authors: Andreia Cerqueira, Francisco Romero-Gavil’an, I’naki Garcia-Arn’aez,Cristina Martinez-Ramos, Seda Ozturan, Raúl Izquierdo, Mikel Azkargorta, F’élix Elortza, Marí’o Gurruchaga, Julio Suay, Isabel Go’ni

   Journal: Materials Science & Engineering C

   DOI: 10.1016/j.msec.2021.112114

   Abstract: Magnesium is the fourth most abundant element in the human body with a wide battery of functions in the maintenance of normal cell homeostasis. In the bone, this element incorporates in the hydroxyapatite structure and it takes part in mineral metabolism and regulates osteoclast functions. In this study, sol-gel materials with increasing concentrations of MgCl2 (0.5, 1, and 1.5%) were synthesized and applied onto Ti surfaces as coatings. The materials were first physicochemically characterized. In vitro responses were examined using the MC3T3-E1 osteoblastic cells and RAW264.7 macrophages. Human serum protein adsorption was evaluated employing nLC-MS/MS. The incorporation of Mg did not affect the crosslinking of the sol-gel network, and a controlled release of Mg was observed; it was not cytotoxic at any of the tested concentrations. The cytoskeleton arrangement of MC3T3-E1 cells cultured on the Mg-doped materials changed in comparison with controls; the cells became more elongated, with protruded lamellipodia and increased cell surface. The expression of integrins (ITGA5 and ITGB1) was boosted by Mg-coatings. The ALP activity and expression of TGF-β, OSX and RUNX2 genes were also increased. In RAW264.7 cells, TNF-α secretion was reduced, while TGF-β and IL-4 expression rose. These changes correlated with the altered protein adsorption patterns. The Mg-doped coatings showed increased adsorption of anti-inflammatory (CLUS, IC1, CFAH, and VTNC), cell adhesion (DSG1, FILA2, and DESP) and tissue regeneration (VTNC and CYTA) proteins. This integrated approach to biomaterial characterization revealed the potential of Mg in bone tissue regeneration.

   Link: https://www.sciencedirect.com/science/article/pii/S0928493121002538

4. Name: Spectroscopic Analysis of Cu(II)-Complexed Thin Films to Characterize Molecular-Level Interactions and Film Behavior

   Authors: Briana A. Capistran and Gary J. Blanchard

   Journal: Langmuir

   DOI: 10.1021/acs.langmuir.1c00849
Abstract: We report on the structure and dynamics of a Cu2+-complexed arachidic acid (AA) monolayer formed by Langmuir–Blodgett (LB) deposition. Infrared reflection–absorption spectroscopy (IRRAS) was used to characterize aliphatic chain −CH2 symmetric and asymmetric stretching modes and determine the chain tilt angle and order as a function of subphase pH. Monolayer structure is controlled by metal ion–amphiphile interactions. At low subphase pH (<5), film buckling at high surface pressure is observed, while for high subphase pH (≥5), monolayer buckling is not observed. This finding is correlated to monolayer structural mediation by metal ion–amphiphile interactions. Dynamics and mobility of a fluorophore incorporated into the monolayer were also affected by Cu2+–AA interactions, determined by fluorescence recovery after photobleaching (FRAP) measurements. These data are consistent with the formation of a rigid film due to Cu2+ coordination to AA headgroups, with the extent of headgroup protonation being determined by the pH of the subphase during monolayer deposition.

Link: [https://pubs.acs.org/doi/10.1021/acs.langmuir.1c00849](https://pubs.acs.org/doi/10.1021/acs.langmuir.1c00849)

5. Name: Consequences of the exposure to bisphenol A in cell membrane models at the molecular level and hamster ovary cell viability

Authors: Mateus D. Maximino, Carla Y. Silva, Dalita G.S.M. Cavalcante, Cibely S. Martin, Aldo E. Job, Osvaldo N. Oliveira Jr, Priscila Al’essio

Journal: Colloids and Surfaces B: Biointerfaces

DOI: 10.1016/j.colsurfb.2021.111762

Abstract: The inadequate disposal and the difficulty in its removal from water treatment systems have made the endocrine disruptor bisphenol A (BPA) a significant hazard for humans and animals. The molecular-level mechanisms of BPA action are not known in detail, which calls for systematic investigations using cell membrane models. This paper shows that BPA affects Langmuir monolayers and giant unilamellar vesicles (GUVs) of 1,2-dipalmitoyl-sn-glycero-3-phosphocholine (DPPC) used as membrane models, in a concentration-dependent manner and with effects that depend on BPA aggregation. BPA increases DPPC monolayer fluidity in surface pressure isotherms upon interacting with the headgroups through hydrogen bonding, according to polarization-modulated infrared reflection absorption spectroscopy (PM-IRRAS). In DPPC GUVs, BPA induced wrinkling and distortion in the spherical shape of the vesicles, but this was only observed for fresh solutions where it is not aggregated. BPA also decreased the viability of hamster ovary cells (CHO) in in vitro experiments. In contrast, aged, aggregated BPA solutions did not affect the GUVs and even increased CHO viability. These results may be rationalized in terms of size-dependent effects of BPA, which may be relevant for its endocrine-disrupting effects.


6. Name: Self-assembled photo-responsive black phosphorus-azobenzene composite Langmuir films with chemical gas sensor and photoelectric conversion applications

Authors: Na Li, Ran Wang, Chongling Wang, Jing Gao, Zhiwei Liu, Jianmin Gu, Tifeng Jiao
Journal: Polymers  
DOI: 10.1016/j.colsurfa.2021.126811  
Abstract: The reasonable design of various functionalized nanocomposites based on black phosphorus (BP) has sparked substantial attention from researchers. In this work, the bulk BP was successfully exfoliated into nanosheets (BPNS), the polyethylenimine (PEI) was selected as the surface protective layer to modify the BPNS for strengthening its stability. We have designed and synthesized two kinds of BPNS-PEI Langmuir composite films containing azobenzene compounds (BPNS-PEI/N-Azo and BPNS-PEI/PAA-Azo) by Langmuir–Blodgett (LB) technology. The composite films were successfully assembled and analyzed the nanoscale structure and morphology using transmission electron microscopy (TEM), atomic force microscopy (AFM), scanning electron microscopy (SEM) and other different characterization methods. In addition, the BPNS-PEI/N-Azo composite films were proven to demonstrate the photoisomerization stability and the acid-alkali atmosphere gas responsiveness by ultraviolet-visible spectroscopy and Fourier transform infrared spectroscopy. Furthermore, the photoelectrochemistry performances of the acquired LB composite films were studied by transferring multilayer films on indium tin oxide (ITO) substrates. And the results demonstrated that the BPNS-PEI/N-Azo self-assembled LB film electrode showed higher photoelectric conversion efficiency. The self-assembled films based on BP, undertaking an appealing conception for gaining a wide range of nano-optical devices, gas sensors and optoelectronic devices.

Link: https://www.sciencedirect.com/science/article/abs/pii/S0927775721006804

7. Name: Influence of Substitutional Groups on the Ordering and Crystallization of Amphiphilic Silsesquioxanes at the Air – Water Interface  
Authors: Utsav, Wei Bu, Binhua Lin, and Rupak Banerjee  
Journal: Langmuir  
DOI: 10.1021/acs.langmuir.1c00420  
Abstract: We report on the surface ordering and crystallization sequences in differently organic-substituted amphiphilic polyhedral silsesquioxane (POSS) variants induced by regulated compression at the air – water interface. Such molecular systems floating at the interface serve as a model system to study dynamic crystallization mediated by weak interactions. In situ grazing incidence X-ray scattering (GIXS) measurements, performed at a synchrotron X-ray source using a liquid surface diffractometer and corroborated with Brewster angle microscopy, revealed transformations for the different POSS variants (viz. trisilanol isobutyl POSS (TBPOSS), trisilanol cyclohexyl POSS (TCHPOSS), disilanol octaisobutyl POSS (DOBPOSS), and trisilanol isooctyl POSS (TOPOSS)) from a weakly correlated monolayer structure to appreciably different structural and crystalline phases in various packing schemes. GIXS measurements revealed a stable nature of the crystallization of DOBPOSS, varying degrees of metastable crystallization for TCHPOSS and TBPOSS, and complete absence of crystalline phase in TOPOSS molecules. Incidentally, for all POSS variants showing crystalline phases, the motifs always assembled in a triclinic lattice with P1̅ symmetry. For the metastable crystals, preferential surface ordering of the crystallites promotes selective crystalline planes to exhibit
preferred tilt angles with respect to the interface. The structural transformations of the differently substituted POSS molecules and their variations therein are attributed to the changing balance of the hydrophobic vs hydrophilic interaction in the layers, which is determined by the anisotropic shape and distribution of substitutitional groups over the nanosized core cage of the monomer, steric interaction between nearest dimeric neighbors, as well as the in-plane and out-of-plane assembly of the overlayers.

Link: https://pubs.acs.org/doi/abs/10.1021/acs.langmuir.1c00420

8. Name: Adsorption and absorption behavior of cationic porphyrin on titania and clay nanosheets
Authors: Yugo Hirade, Tamao Ishida, Tetsuya Shimada, Shinsuke Takagi
Journal: Colloids and Surfaces A: Physicochemical and Engineering Aspects
DOI: 10.1016/j.colsurfa.2021.126747

Abstract: In this study, the adsorption and absorption behavior of porphyrin derivatives on inorganic nanosheets were investigated. The relationship between the adsorption orientation angle (θₐd) and the maximum absorption wavelength (λₘₐₓ) of tetra (N-methyl-4-pyridinium)-porphyrin (p-TMPyP⁴⁺) derivatives adsorbed on clay nanosheet (Sumecton SA (SSA)) and titania nanosheet (TNS, Ti₀.₈⁹□₀.₁₁O₂⁻₀.₁¹) monolayer film prepared by the Langmuir-Blodgett method was examined by dichroic waveguide spectroscopy. The λₘₐₓ of each TMPyP⁴⁺ was red-shifted by an adsorption on the nanosheets. For example, the λₘₐₓ of p-TMPyP⁴⁺ in water was 422 nm, while that was shifted to 450 and 459 nm upon an adsorption on SSA and TNS, respectively. According to dichroic measurements, the θₐd of p-TMPyP⁴⁺ was estimated to be 13 and 3 degrees on SSA and TNS, respectively. Judging from the results for all porphyrin, a strong correlation between the λₘₐₓ shift upon an adsorption and the θₐd on nanosheets was found out. In addition, it was turned out that the θₐd depends on the electrostatic interactions between porphyrin and anionic nanosheets. Thus, the λₘₐₓ shift upon an adsorption can be controlled by the combination of porphyrin and nanosheet.

Link: https://www.sciencedirect.com/science/article/abs/pii/S0927775721006166

9. Name: Discerning perturbed assembly of lipids in a model membrane in presence of violacein
Authors: Ritika Gupta, Saheli Mitra, Subhadip Chowdhury, Gangadhar Das, Richa Priyadarshini, Mrinmay K. Mukhopadhyay, Sajal K. Ghosh
Journal: Biochimica et Biophysica Acta (BBA) - Biomembranes
DOI: 10.1016/j.bbamem.2021.183647

Abstract: Violacein is a naturally found pigment that is used by some gram negative bacteria to defend themselves from various gram positive bacteria. As a result, this molecule has caught attention for its potential biomedical applications and has already shown promising outcomes as an antiviral, an antibacterial, and an anti-tumor agent. Understanding the interaction of this molecule with a cellular membrane is an essential step to extend its use in the pharmaceutical paradigm. Here, the interaction of violacein with a lipid monolayer formed at the air – water interface is found to depend on electrostatic nature of lipids. In presence of violacein, the two dimensional (2D) pressure – area isotherms of lipids have exhibited changes in their phase transition pressure and in-plane elasticity. To gain insights into the out-of-plane structural
organization of lipids in a membrane, X-ray reflectivity (XRR) study on a solid supported lipid monolayer on a hydrophilic substrate has been performed. It has revealed that the increase in membrane thickness is more pronounced in the zwitterionic and positively charged lipids compared to the negatively charged one. Further, the lipid molecules are observed to decrease their tilt angle made with the normal of lipid membrane along with an alteration in their in-plane ordering. This has been quantified by grazing incidence X-ray diffraction (GIXD) experiments on the multilayer membrane formed in an environment with controlled humidity. The structural reorganization of lipid molecules in presence of violacein can be utilized to provide a detailed mechanism of the interaction of this molecule with cellular membrane.


10. **Name:** Phase transition beyond the monolayer collapse - The case of stearic acid spread at the air/water interface  
**Authors:** Jose Luis Fidalgo Rodriguez, Luciano Caseli, Raul Torres Rodrigues, Jose Minones Conde, Patrycja Dynarowicz-Latka  
**Journal:** Colloids and Surfaces A: Physicochemical and Engineering Aspects  
**DOI:** 10.1016/j.colsurfa.2021.126781  
**Abstract:** The paper presents a detailed characterization of stearic acid film in various experimental conditions, recorded both in the pre- and post-collapse region, using π–A isotherms - visualization of film structure and thickness measurements (using Brewster angle microscope, BAM) supplemented with a precise analysis of compressibility modulus versus area (Cs−1-A) plots. π–A isotherms recorded for unionized molecules exhibit a liquid-condensed (LC) state where the thickness (th) and the compressibility modulus (Cs−1) remain constant with monolayer compression along a plateau region, where a tilt angle of 73.5°, in respect to the water surface, was calculated for stearic acid molecule. Films subjected to subsequent compressions (beyond the collapse) and expansions show semi-reversible behavior as proved with BAM images. Upon the increase of carboxylic group ionization in alkaline pHs and increasing the speed of compression, the “spike” at the collapse changed its shape from sharp to rounded. Upon further compression, a long plateau transition has been observed. Within this post-collapse plateau, a three-fold increase in film thickness was observed, confirming the previously suggested model of trilayer formation. However, the visualization of film structure with BAM revealed that this process does not occur homogeneously, but through the nucleation of trilayer structures in the form of domains that undergo a continuous process of growth and coalescence within the post-collapse plateau region. The application of the adapted Clausius-Clapeyron equation indicates that the process of trilayer formation is endothermic and implies an increase of entropy, which has been additionally proven by PM-IRRAS.  
11. Name: A Solution-processed Inorganic Emitter with High Spectral Effectiveness for Efficient Daytime Radiative Cooling in Hot Humid Climatess
Authors: Chongjia Lin, Baoling Huang
Journal: Research Square
DOI: 10.21203/rs.3.rs-235967/v1
Abstract: Daytime radiative cooling provides an eco-friendly solution to space cooling with zero energy consumption. Despite significant advances, most state-of-the-art radiative coolers show broadband infrared emission with low spectral effectiveness, which limits their cooling temperatures and climate applicabilities, especially in hot humid regions. Here we report an all-inorganic narrowband cooler comprising a solution-derived SiOxNy layer sandwiched between a reflective substrate and a self-assembly monolayer of SiO2 microspheres. It shows a high and diffusive solar reflectance (96%) and strong infrared-selective emittance (94.6%) with superior spectral effectiveness (1.44). Remarkable subambient cooling of up to 5°C was achieved under high humidity without any solar shading or convection cover at noontime in a subtropical coastal city, Hong Kong. Owing to the all-inorganic hydrophobic structure, the emitter showed outstanding resistance to ultraviolet and water in the long-term durability tests. The scalable solution-based fabrication renders this stable high-performance emitter promising for large-scale deployment in various climates.
Link: https://www.researchsquare.com/article/rs-235967/v1

12. Name: Ultrastable Glassy Polymer Films with an Ultradense Brush Morphology
Authors: Biao Zuo, Cheng Li, Quanyin Xu, Katelyn Randazzo, Naisheng Jiang, Xinping Wang, and Rodney D. Priestley
Journal: ACS Nano
DOI: 10.1021/acsnano.0c09631
Abstract: Glassy polymer films with extreme stability could enable major advancements in a range of fields that require the use of polymers in confined environments. Yet, from a materials design perspective, we now know that the glass transition temperature (Tg) and thermal expansion of polymer thin films can be dramatically different from those characteristics of the bulk, i.e., exhibiting confinement-induced diminished thermal stability. Here, we demonstrate that polymer brushes with an ultrahigh grafting density, i.e., an ultradense brush morphology, exhibit a significant enhancement in thermal stability, as manifested by an exceptionally high Tg and low expansivity. For instance, a 5 nm thick polystyrene brush film exhibits an ∼75 K increase in Tg and ∼90% reduction in expansivity compared to a spin-cast film of similar thickness. Our results establish how morphology can overcome confinement and interfacial effects in controlling thin-film material properties and how this can be achieved by the dense packing and molecular ordering in the amorphous state of ultradense brushes prepared by surface-initiated atom transfer radical polymerization in combination with a self-assembled monolayer of initiators.
Link: https://pubs.acs.org/doi/abs/10.1021/acsnano.0c09631
13. Name: Piperazine-based two-dimensional covalent organic framework for high performance anodic lithium storage  
Authors: Rui Zhou, Yang Huang, Zhenhu Li, Shuai Kang, Xiaomin Wang, Shuangyi Liu  
Journal: Energy Storage Materials  
DOI: 10.1016/j.ensm.2021.05.008  
Abstract: The controllably spatial and chemical structures and abundantly elemental reserves of covalent organic frameworks (COFs) endow them the potential of being applied in next generation of electrochemical lithium-ions storage with high performances. Here, a piperazine-based two-dimensional covalent organic framework (PTDCOF) is designed and synthesized. PTDCOF is constructed by triphenylene units through irreversible piperazine linkages to afford the regular in-plane pores sized ~11 Å. PTDCOF is characterized with few-layered features, which is crystalized through eclipsed (AA) and staggered (AB) stacking modes together. And the synthesized framework exhibits excellent stability upon harsh chemical environments. As the active material of anodic lithium storage, the guest-eliminated product derived by PTDCOF demonstrates remarkable lithiation (1644.3 mAh g$^{-1}$ capacity contribution at 0.1 A g$^{-1}$), rate and cycling performances. The abundant active sites lead to a high and reversible lithium loading of at least 14 lithium atoms per triphenylene unit (Li$_{14}$(C$_{18}$N$_3$H$_9$)). Such product presents superior anodic lithiation capability comparing with previously reported carbonaceous materials. This study provides a possible and attractive path for hunting the high performances of lithium or other metal ions storage systems.  

14. Name: Study of the interactions of gold nanoparticles functionalized with aminolevulinic acid in membrane models  
Authors: Rafael Leonardo C.G. da Silva, Karina de Oliveira Gonçalves, Lilia Coronato Courrol, Luciano Caseli  
Journal: Colloids and Surfaces B: Biointerfaces  
DOI: 10.1016/j.colsurfb.2021.111849  
Abstract: Gold nanoparticles have been intensively studied in cancer therapy to improve drug release, increasing therapeutic action and reducing adverse effects. The interaction between gold nanoparticles and cell membranes can give information about the cell internalization. In this study, gold nanoparticles with aminolevulinic acid (5-ALA) were synthesized using the photoreduction method (5-ALA: AuNPs). The prodrug 5-ALA is responsible for protoporphyrin IX synthesis inside the cell and allows the use of therapies as photodynamic and sonodynamic therapies. The cytotoxicity test was performed on a breast cancer tumor line (MCF-7), and high Content Screening assay was applied to evaluate the entry of nanoparticles into cells. DPPS Langmuir monolayers were assembled at the air/water interface and employed as a simplified membrane model for half of a tumorigenic cell membrane. We assessed the molecular interactions between 5-ALA: AuNPs and phospholipids using tensiometry ($\pi$-A isotherms) and vibrational spectroscopy (PM-IRRAS) experiments. We found that the functionalized gold nanoparticles strongly interact with DPPS polar head groups (especially phosphate and carbonyl), changing the phospholipid hydration and leading to a general decrease in the monolayer
conformational order. This work then probes that specific interaction between 5-ALA: AuNPs and the negatively charged phospholipid can be assessed using Langmuir monolayers as simplified biomembrane models.


**15. Name:** The influence of ergosterol on the action of the hop oil and its major terpenes on model fungi membranes. Towards understanding the mechanism of action of phytochemicals for food and plant protection

**Authors:** Karolina Pole´, Karolina Olechowska, Amanda Klejdysz, Michał Dymek, Rafał Rachwalik, El´zbieta Sikora, Katarzyna Hąc-Wydro

**Journal:** Chemistry and Physics of Lipids

**DOI:** 10.1016/j.chemphyslip.2021.105092

**Abstract:** The aim of this work was to find the correlation between the content of ergosterol in fungi membrane and the action of the hop essential oil, myrcene and humulene on its properties. To reach this goal, the monolayers and bilayers composed of phosphatidylcholine, phosphatidylethanol amine and ergosterol, differing in the concentration of sterol, were used as model membrane systems. The impact of the essential oil and its major terpenes on one component ergosterol film was also investigated.

It was found that pure isolated terpenes, in contrast to the hop oil being the mixture of them, do not incorporate into pure ergosterol membrane, however, they cause the loss of monolayer material from the interface. These results are in contrast to the effect of these terpenes on phospholipid films reported previously and they may suggest a strong effect of ergosterol on the behavior of terpenes in the mixed systems. Surprisingly, for model membranes, the effect of myrcene was qualitatively similar to the effect of the hop oil and ergosterol was found to regulate the incorporation of both these substances into the film. In contrast, very strong correlation between ergosterol content and the action of humulene was found. Namely, the ability of humulene to change model membrane properties was found to increase with ergosterol concentration. Additionally, the differentiating effect of ergosterol on humulene action in membranes was much more pronounced than for myrcene or the hop oil. Interestingly, at the highest ergosterol level the influence of humulene was even stronger than the effect of the hop oil. This is very important finding suggesting that ergosterol may regulate the sensitivity of particular membrane to the impact of humulene. Summarizing, ergosterol substantially differentiates the effect of the hop oil, myrcene and humulene on the lipid systems and it can be the molecule important for antifungal effect of the essential oil and terpenes.

**Link:** [https://www.sciencedirect.com/science/article/pii/S0009308421000451](https://www.sciencedirect.com/science/article/pii/S0009308421000451)