References

Alfaro, A. d. T., Balbinot, E., Weber, C. I., Tonial, I. B., & Machado-Lunkes, A. (2014). Fish Gelatin: Characteristics, Functional Properties, Applications and Future Potentials. *Food Engineering Reviews*, *7*(1), 33-44. https://doi.org/10.1007/s12393-014-9096-5

ASTM, A. (2000). Annual Book of ASTM Standards, vol. 04.08. In: USA.

Campalani, C., Causin, V., Selva, M., & Perosa, A. (2022). Fish-Waste-Derived Gelatin and Carbon Dots for Biobased UV-Blocking Films. *ACS Appl Mater Interfaces*, *14*(30), 35148-35156. https://doi.org/10.1021/acsami.2c11749

Chelladurai, D., Alaguthevar, R., Murugesan, B., Subburamu, K., Khan, A., & Rhim, J.-W. (2024). Carbon quantum dots: Progress toward food safety and sustainability. *Food Bioscience*, *61*. https://doi.org/10.1016/j.fbio.2024.105016

Cheng, C., Chen, S., Su, J., Zhu, M., Zhou, M., Chen, T., & Han, Y. (2022). Recent advances in carrageenan-based films for food packaging applications. *Front Nutr*, *9*, 1004588. https://doi.org/10.3389/fnut.2022.1004588

Cui, L., Ren, X., Sun, M., Liu, H., & Xia, L. (2021). Carbon Dots: Synthesis, Properties and Applications. *Nanomaterials (Basel)*, *11*(12). https://doi.org/10.3390/nano11123419

Deepika, Kumar, L., & Gaikwad, K. K. (2023). Carbon dots for food packaging applications. *Sustainable Food Technology*, *1*(2), 185-199. https://doi.org/10.1039/d2fb00020b

Derkach, S. R., Voron'ko, N. G., Kuchina, Y. A., & Kolotova, D. S. (2020). Modified Fish Gelatin as an Alternative to Mammalian Gelatin in Modern Food Technologies. *Polymers (Basel)*, *12*(12). https://doi.org/10.3390/polym12123051

Ellerbrock, R., Stein, M., & Schaller, J. (2022). Comparing amorphous silica, short-range-ordered silicates and silicic acid species by FTIR. *Sci Rep*, *12*(1), 11708. https://doi.org/10.1038/s41598-022-15882-4

Gómez-Guillén, M. C., Pérez-Mateos, M., Gómez-Estaca, J., López-Caballero, E., Giménez, B., & Montero, P. (2009). Fish gelatin: a renewable material for developing active biodegradable films. *Trends in Food Science & Technology*, *20*(1), 3-16. https://doi.org/10.1016/j.tifs.2008.10.002

Han, J. H., & Floros, J. D. (1997). Casting antimicrobial packaging films and measuring their physical properties and antimicrobial activity [Article]. *Journal of Plastic Film and Sheeting*, *13*(4), 287-298. https://doi.org/10.1177/875608799701300405

Hilliou, L., Freitas Moraes, I. C., & Almeida, P. L. (2025). From the seaweeds' carrageenan composition to the hybrid carrageenans' hydrogel elasticity: Identification of a relationship based on the content in iota-carrageenan. *Food Hydrocolloids*, *162*. https://doi.org/10.1016/j.foodhyd.2024.111007

Huang, R., Yao, A., Yan, Y., Wang, J., Li, Q., Li, K., Tian, Y., Wang, S., & Wu, J. (2024). Development and characterization of multifunctional fish gelatin composite films reinforced with ε-polylysine and zinc oxide nanoparticles. *eFood*, *5*(4). https://doi.org/10.1002/efd2.179

Huang, T., Tu, Z.-c., Shangguan, X., Sha, X., Wang, H., Zhang, L., & Bansal, N. (2019). Fish gelatin modifications: A comprehensive review. *Trends in Food Science & Technology*, *86*, 260-269. https://doi.org/10.1016/j.tifs.2019.02.048

Kantakul, J., Nilsuwan, K., Kotcharat, C., Chuecheen, K., Saetang, J., Prodpran, T., Hong, H., Zhang, B., & Benjakul, S. (2024). Properties of Antioxidant Film Based on Protein Isolate and Seed Coat Extract from Bambara Groundnut. *Foods*, *13*(21). https://doi.org/10.3390/foods13213424

Khan, A., Priyadarshi, R., Bhattacharya, T., & Rhim, J.-W. (2023). Carrageenan/Alginate-Based Functional Films Incorporated with Allium sativum Carbon Dots for UV-Barrier Food Packaging. *Food and Bioprocess Technology*, *16*(9), 2001-2015. https://doi.org/10.1007/s11947-023-03048-7

Li, R., Wang, S., Feng, H., Zhuang, D., & Zhu, J. (2024). An intelligent chitosan/gelatin film via improving the anthocyanin-induced color

recognition accuracy for beef sub-freshness differentiation monitoring. *Food Hydrocolloids*, *146*. https://doi.org/10.1016/j.foodhyd.2023.109219

Lou, Y., Hao, X., Liao, L., Zhang, K., Chen, S., Li, Z., Ou, J., Qin, A., & Li, Z. (2021). Recent advances of biomass carbon dots on syntheses, characterization, luminescence mechanism, and sensing applications. *Nano Select*, *2*(6), 1117-1145. https://doi.org/10.1002/nano.202000232

Luo, Q., Hossen, M. A., Zeng, Y., Dai, J., Li, S., Qin, W., & Liu, Y. (2022). Gelatin-based composite films and their application in food packaging: A review. *Journal of Food Engineering*, *313*. https://doi.org/10.1016/j.jfoodeng.2021.110762

Mahmood, K., Lubowa, M., Fazilah, A., Kamilah, H., Razak, B., & Sulaiman, S. (2016). Review of Fish Gelatin Extraction, Properties and Packaging Applications. *Food Science and Quality Management*, *56*, 47-59.

Manias, E., & Utracki, L. A. (2014). Thermodynamics of Polymer Blends. In L. A. Utracki & C. A. Wilkie (Eds.), *Polymer Blends Handbook* (pp. 171-289). Springer Netherlands. https://doi.org/10.1007/978-94-007-6064-6_4

Mansuriya, B. D., & Altintas, Z. (2021). Carbon Dots: Classification, Properties, Synthesis, Characterization, and Applications in Health Care-An Updated Review (2018-2021). *Nanomaterials (Basel)*, *11*(10). https://doi.org/10.3390/nano11102525

Marzlan, A. A., Muhialdin, B. J., Zainal Abedin, N. H., Manshoor, N., Ranjith, F. H., Anzian, A., & Meor Hussin, A. S. (2022). Incorporating torch ginger (Etlingera elatior Jack) inflorescence essential oil onto starch-based edible film towards sustainable active packaging for chicken meat. *Industrial Crops and Products*, *184*, 115058. https://doi.org/https://doi.org/10.1016/j.indcrop.2022.115058

Meng, F., Zhang, Y., Xiong, Z., Wang, G., Li, F., & Zhang, L. (2018). Mechanical, hydrophobic and thermal properties of an organic-inorganic hybrid carrageenan-polyvinyl alcohol composite film. *Composites Part B: Engineering*, *143*, 1-8. https://doi.org/10.1016/j.compositesb.2017.12.009

Min, S., Ezati, P., & Rhim, J.-W. (2022). Gelatin-based packaging material incorporated with potato skins carbon dots as functional filler. *Industrial Crops and Products*, *181*. https://doi.org/10.1016/j.indcrop.2022.114820

Munteanu, I. G., & Apetrei, C. (2021). Analytical Methods Used in Determining Antioxidant Activity: A Review. *Int J Mol Sci*, *22*(7). https://doi.org/10.3390/ijms22073380

Murugan, G., Khan, A., Nilsuwan, K., Kim, J. T., Benjakul, S., & Rhim, J.-W. (2024a). Chitosan/Polyvinyl Alcohol Based Blend Film Containing Tangerine Peel Carbon Dots: Properties, Antioxidant and Antibacterial Activities. *Waste and Biomass Valorization*. https://doi.org/10.1007/s12649-024-02799-4

Murugan, G., Nilsuwan, K., Prodpran, T., Ponnusamy, A., Rhim, J. W., Kim, J. T., & Benjakul, S. (2024b). Active Fish Gelatin/Chitosan Blend Film Incorporated with Guava Leaf Powder Carbon Dots: Properties, Release and Antioxidant Activity. *Gels*, *10*(4). https://doi.org/10.3390/gels10040281

Nilsuwan, K., Benjakul, S., & Prodpran, T. (2018). Physical/thermal properties and heat seal ability of bilayer films based on fish gelatin and poly(lactic acid). *Food Hydrocolloids*, *77*, 248-256. https://doi.org/10.1016/j.foodhyd.2017.10.001

Nuthong, P., Benjakul, S., & Prodpran, T. (2009). Characterization of porcine plasma protein-based films as affected by pretreatment and cross-linking agents. *Int J Biol Macromol*, *44*(2), 143-148. https://doi.org/10.1016/j.ijbiomac.2008.11.006

Ozyurt, D., Kobaisi, M. A., Hocking, R. K., & Fox, B. (2023). Properties, synthesis, and applications of carbon dots: A review. *Carbon Trends*, *12*. https://doi.org/10.1016/j.cartre.2023.100276

Peng, B., Qin, J., Li, Y., Wu, K., Kuang, Y., & Jiang, F. (2024). Recent advances in nanomaterials-enabled active food packaging: Nanomaterials synthesis, applications and future prospects. *Food Control*, *163*. https://doi.org/10.1016/j.foodcont.2024.110542

Ponnusamy, A., Khan, A., Prodpran, T., Kim, J. T., Benjakul, S., & Rhim, J. W. (2025). Active packaging film based on chitosan/gelatin blend incorporated with mango peel carbon dots: Properties and shelf life extension of minced pork. *Int J Biol Macromol*, *288*, 138692. https://doi.org/10.1016/j.ijbiomac.2024.138692

Pranoto, Y., Lee, C. M., & Park, H. J. (2007). Characterizations of fish gelatin films added with gellan and κ-carrageenan. *LWT - Food Science and Technology*, *40*(5), 766-774. https://doi.org/10.1016/j.lwt.2006.04.005

Praseptiangga, D., Sesari, A. R., Rochima, E., Muhammad, D. R. A., Widyaastuti, D., Zaman, M. Z., Widiyastuti, Syamani, F. A., Nazir, N., Joni, I. M., & Panatarani, C. (2024). Development and characterization of semi-refined iota carrageenan/fish gelatin-based biocomposite film incorporated with SiO(2)/ZnO nanoparticles. *Int J Biol Macromol*, *271*(Pt 1), 132569. https://doi.org/10.1016/j.ijbiomac.2024.132569

Roy, S., Ezati, P., & Rhim, J.-W. (2021). Gelatin/Carrageenan-Based Functional Films with Carbon Dots from Enoki Mushroom for Active Food Packaging Applications. *ACS Applied Polymer Materials*, *3*(12), 6437-6445. https://doi.org/10.1021/acsapm.1c01175

Roy, S., & Rhim, J.-W. (2020). Preparation of Gelatin/Carrageenan-Based Color-Indicator Film Integrated with Shikonin and Propolis for Smart Food Packaging Applications. *ACS Applied Bio Materials*, *4*(1), 770-779. https://doi.org/10.1021/acsabm.0c01353

Sabu Mathew, S., Jaiswal, A. K., & Jaiswal, S. (2024). Carrageenan-based sustainable biomaterials for intelligent food packaging: A review. *Carbohydr Polym*, *342*, 122267. https://doi.org/10.1016/j.carbpol.2024.122267

Schrieber, R., & Gareis, H. (2007). *Gelatine Handbook: Theory and Industrial Practice*. WILEY-VCH Verlag GmbH & Co. KGaA.

Singh, S. (2006). Impact of color on marketing. *Management Decision*, *44*(6), 783-789. https://doi.org/10.1108/00251740610673332

Su, J., & Wang, S. (2023). Influence of food packaging color and foods type on consumer purchase intention: the mediating role of perceived fluency. *Front Nutr*, *10*, 1344237. https://doi.org/10.3389/fnut.2023.1344237

Tagrida, M., Nilsuwan, K., Gulzar, S., Prodpran, T., & Benjakul, S. (2023). Fish gelatin/chitosan blend films incorporated with betel (Piper betle L.) leaf ethanolic extracts: Characteristics, antioxidant and antimicrobial properties. *Food Hydrocolloids*, *137*. https://doi.org/10.1016/j.foodhyd.2022.108316

Tasende, M. G., & Manriquez-Hernandez, J. (2016). Carrageenan Properties and Applications: A Review. In (pp. 17-50).

van de Velde, F., Pereira, L., & Rollema, H. S. (2004). The revised NMR chemical shift data of carrageenans. *Carbohydr Res*, *339*(13), 2309-2313. https://doi.org/10.1016/j.carres.2004.07.015

Visvini, G. A., Mathioudakis, G. N., Soto Beobide, A., & Voyiatzis, G. A. (2024). Tuning of Water Vapor Permeability in 2D Nanocarbon-Based Polypropylene Composite Membranes. *Nanomaterials (Basel)*, *15*(1). https://doi.org/10.3390/nano15010011

Wei, M., Shan, M., Zhang, L., Chen, N., Tie, H., Xiao, Y., & Li, Z. (2024). Preparation of gelatin/κ-carrageenan active films through procyanidins crosslinking: Physicochemical, structural, antioxidant and controlled release properties. *Food Hydrocolloids*, *153*. https://doi.org/10.1016/j.foodhyd.2024.110023

Wu, J., Yan, Z., Shan, P., Li, W., Wang, K., & Li, H. (2025). Characterization of gelatin-based composite films loaded with polysaccharide and carbon dots from Stropharia rugosoannulata and their application in pork fresh-keeping. *Int J Biol Macromol*, *297*, 139702. https://doi.org/10.1016/j.ijbiomac.2025.139702

Xu, X., Ray, R., Gu, Y., Ploehn, H. J., Gearheart, L., Raker, K., & Scrivens, W. A. (2004). Electrophoretic Analysis and Purification of Fluorescent Single-Walled Carbon Nanotube Fragments. *Journal of the American Chemical Society*, *126*(40), 12736-12737. https://doi.org/10.1021/ja040082h

Xue Mei, L., Mohammadi Nafchi, A., Ghasemipour, F., Mat Easa, A., Jafarzadeh, S., & Al-Hassan, A. A. (2020). Characterization of pH sensitive sago starch films enriched with anthocyanin-rich torch ginger extract. *International Journal of Biological Macromolecules*, *164*, 4603-4612. https://doi.org/10.1016/j.ijbiomac.2020.09.082

Zhang, X., Wang, H., Niu, N., Chen, Z., Li, S., Liu, S.-X., & Li, J. (2020). Fluorescent Poly(vinyl alcohol) Films Containing Chlorogenic Acid Carbon Nanodots for Food Monitoring. *ACS Applied Nano Materials*, *3*(8), 7611-7620. https://doi.org/10.1021/acsanm.0c01229

Zhao, L., Zhang, M., Mujumdar, A. S., & Wang, H. (2023). Application of carbon dots in food preservation: a critical review for packaging enhancers and food preservatives. *Crit Rev Food Sci Nutr*, *63*(24), 6738-6756. https://doi.org/10.1080/10408398.2022.2039896