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Modification of Acrylic Paint by Acetamide to Be Antibacterial Used for Medical Applications

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Abstract

This study aimed to develop an innovative approach to produce an organic antibacterial composite material by combining acrylic paint and acetamide through a simple mixing method. Acetamide, known for its potent antibacterial properties, underwent a thorough evaluation to assess its effectiveness in the composite. The antibacterial properties were evaluated using established methods such as the minimum inhibitory concentration (MIC) and the agar well diffusion test. These tests provided quantitative and qualitative measures of inhibitory activity against two common bacterial strains, namely S. aureus and S. epidermidis. The results showed a clear correlation between the concentration of acetamide in the composite and its antibacterial activity. Higher concentrations of acetamide led to a significant increase in the effectiveness of the composite material against the targeted bacterial strains. In addition to the antibacterial properties, the mechanical and physical properties of the composite material were also analyzed comprehensively. Parameters such as wettability, swelling ratio and chemical structure were thoroughly investigated using Fourier Transform Infrared (FTIR) analysis. This comprehensive characterization enabled a detailed understanding of the behavior and performance of the composite material.

The results of this study are auspicious in the context of operating rooms. The proposed composite antibacterial polymer coatings, utilizing organic or inorganic agents at low concentrations, represent an effective solution to eliminate bacteria and maintain a sterile environment. These coatings can be applied to operating room walls and offer improved infection control and reduced bacterial contamination risk.

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Keywords: antibacterial polymer, acrylic paint, acetamide, well diffusion, medical applications

References

1. Siedenbiedel, F., Tiller, J.C.: Antimicrobial polymers in solution and on surfaces: overview and functional principles. J. Polymers. **4**, 46–71 (2012)
2. Ali, Z.A.,Yahya, R., Puteh, R.:Antibacterial polymer based transparent coating for elimination of Staphylococcus aureus. J. Procedia-Soc. Behav. Sci. **195**, 2218–2220 (2015)
3. Hasan, J., Crawford, R.J., Ivanova, E.P.: Antibacterial surfaces: the quest for a new generation of biomaterials. Trends Biotechnol. **31**, 295–304 (2013)
4. Liquitex: The Acrylic Book: A Comprehensive Resource for Artists: Liquitex ArtistMaterials (2007). 116 p.
5. Speight, J.G.: Handbook of Industrial Hydrocarbon Processes. Gulf Professional Publishing (2019)
6. Frost, R., Kristof, J., Paroz, G., Kloprogge, J.: Intercalation of kaolinite with acetamide. Phys. Chem. Minerals **26**, 257–63 (1999)
7. Banjara, R., Jadhav, S., Bhoite, S.: MIC for determination of antibacterial activity of di-2-ethylaniline phosphate. J. Chem. Pharm. Res. **4**, 648–652 (2012)
8. Irobi, O., Moo-Young, M., Anderson,W., Daramola, S.: Antimicrobial activity of bark extracts of Bridelia ferruginea (Euphorbiaceae). J. Ethnopharmacol. **43**, 185–190 (1994)
9. Majdi, H.S., Saud, A., Al-Mamoori, M.: A novel nanocomposite (SR/HA/-nZnO) material for medical application. In: Tiginyanu, I., Sontea,V., Raileanof, S. (eds.) ICNBME2019. Springer, Cham (2020). https://doi.org/10.1007/978-3-030-31866-6_63