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Developing a method to increase the hardness of beeswax for wax sculpture industry

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Beeswax is a natural wax produced by bees in their wax glands. Generally, it is malleable in nature. The hardness of beeswax has to increase or decrease according to the application where it is utilized. Usually, in the wax sculpture industry, hardened beeswax is needed. Mainly this research shows an approach to increase the hardness of beeswax by using additives such as resin (rosin) and calcium sulphate hemihydrate (plaster of Paris) in different ratios. Based on the study it was found that 1:1:1 and 1:2:1 (beeswax: rosin: plaster of Paris) ratios were the best ratios of additives which can be used to increase the hardness of beeswax. Shore-A method, a method that used to measure the hardness of 'softer' polymers like beeswax, was used to measure the hardness of hardened beeswax and hardness values for the aforementioned ratios were 95 and 97 respectively. After determining the optimum ratio of ingredients, certain qualitative analyses such as determination of melting point of hardened beeswax, and investigation of a suitable solvent to dissolve beeswax were carried out. Further, Fourier transform infrared spectroscopic analysis (FTIR) was carried out to determine the functional groups present in beeswax. From the melting point analysis, it was found that there is a relationship between hardness and melting point. Kerosene oil was found to be the best solvent among other solvents, such as acetone, toluene, diethyl ether, and thinner, to dissolve hardened beeswax. Thereby it was concluded that hardened beeswax contained hydrocarbons since kerosene contains hydrocarbons largely. The presence of hydrocarbons in beeswax was proved by FTIR analysis. Ultimately, it is concluded that all the beeswax samples largely contain non-polar hydrocarbons (aliphatic alkanes) and increasing hardness of beeswax occurs due to formation of a new solid phase, which is to be studied further.

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