

Solubility Parameter of Shellac

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A value of 12.5 ± 2.0 is assigned for the solubility parameter of shellac. The wide range, rather than a precise value, is ascribed to the complex nature of shellac and the presence of many polar functional groups.

THE term $\Delta E/V$ (where ΔE is the energy of vaporization and V , the molar volume) is known as the cohesive energy density and its square root, $(\Delta E/V)^{1/2}$, the solubility parameter (δ) (ref. 1). Brydson² has shown from a simple thermodynamic approach that the knowledge of this property helps in assessing the usefulness of materials as solvents, plasticizers, extenders, lubricants, etc., and there is increasing likelihood of mixing in the case of substances with similar solubility parameters.

Shellac is soluble in a wide range of solvents³; this is obviously due to its complex character and the presence of various functional groups, such as carboxyl, hydroxyl and carbonyl⁴.

The solubility behaviour of shellac can be partly explained on the basis of the solubility parameter. Thus, when anhydrous, shellac is not soluble in pure dry solvents like acetone and requires the presence of polar helpers like water, alcohols or acids for effecting solution. The polar helpers have higher solubility parameters and when present in small amounts tend to raise that of acetone, thus helping solution.

Palit⁵ investigated quantitatively the influence of water and other polar helpers on the shellac-acetone system. Based on his figures, it is calculated that shellac solubilizes in a solvent having a minimum solubility parameter of 10.5. A maximum solubility parameter of 14.5 for a solvent (methanol) for shellac is also noticed. Thus, a value of 12.5 ± 2.0 may be assigned for the solubility parameter of shellac. The wide range for the value can be ascribed to its complex structure and the presence of a number of polar functional groups in it.

References

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