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**INFRARED SPECTROSCOPY AND ELECTRICAL
CONDUCTIVITY OF COPPER(II) 4-AMINOBENZOATE AND
IODINE-DOPED COPPER(II) 4-AMINOBENZOATE**

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Abstract

Copper(II) 4-aminobenzoate (CAB), prepared from copper(II) acetate monohydrate and 4-aminobenzoic acid, was a dark green powder. Fourier Transform Infrared (FTIR) spectrum of CAB, recorded as KBr disc, indicated the presence of all bonds and functional groups expected of it, and the absence of hydrogen bonding. Its conductivity at room temperature was $4.2 \times 10^{-11} \text{ Scm}^{-1}$. The value increased as temperature decreased indicating metallic behaviour. Density of states at Fermi level, hopping distance, hopping energy and density of charge carriers calculated based on Mott's Variable Range Hopping model (VRH) are $2.65 \times 10^{22} (\text{eV})^{-1} \text{ cm}^{-3}$, $7.47 \times 10^{-8} \text{ cm}$, 0.02 eV and $6.87 \times 10^{20} \text{ cm}^{-3}$ respectively.

CAB was then doped with iodine up to 28%. FTIR for all doped samples, recorded as KBr disc, indicated that iodine did not have visible effect on its structure. CAB doped with 20% iodine had maximum conductivity at room temperature of $5.4 \times 10^{-10} \text{ Scm}^{-1}$. Its density of states at Fermi level, hopping distance, hopping energy and density of charge carriers calculated based on VRH model are $2.31 \times 10^{23} (\text{eV})^{-1} \text{ cm}^{-3}$, $4.35 \times 10^{-8} \text{ cm}$, 0.013 eV and $5.97 \times 10^{21} \text{ cm}^{-3}$ respectively.

CAB and CAB doped with 20% I_2 were also annealed at 50°C - 200°C in nitrogen ambient. FTIR spectra indicated that CAB underwent cross-linking at 100°C , and the maximum conductivity was $4.56 \times 10^{-10} \text{ Scm}^{-1}$ at 150°C . In contrast, CAB doped with 20% iodine did not undergo cross-linking, and the conductivity showed a minimum value of $1.13 \times 10^{-10} \text{ Scm}^{-1}$ at 100°C .

Abstrak

Kuprum(II) 4-aminobenzoat (CAB) yang disediakan dari kuprum(II) asetat monohidrat dan asid 4-aminobenzoik adalah serbuk hijau gelap. Spektrum Transformasi Fourier Inframerah (FTIR) bagi CAB, direkodkan sebagai cakera KBr, menunjukkan kehadiran semua ikatan dan kumpulan berfungsi yang dijangkakan, dan ketidakhadiran ikatan hidrogen. Kekonduksiannya pada suhu bilik adalah $4.2 \times 10^{-11} \text{ Scm}^{-1}$. Peningkatan kekonduksian apabila suhu mengurang menunjukkan bahawa CAB bersifat seperti logam. Ketumpatan keadaan pada paras Fermi, jarak loncatan, tenaga loncatan dan ketumpatan pembawa cas, dikira berdasarkan model Loncatan Pelbagai Julat Mott (VRH), adalah masing-masing $2.65 \times 10^{22} (\text{eV})^{-1} \text{ cm}^{-3}$, $7.47 \times 10^{-8} \text{ cm}$, 0.02 eV dan $6.87 \times 10^{20} \text{ cm}^{-3}$.

CAB kemudiannya didopkan dengan iodin sehingga 28%. Spektrum FTIR semua sampel yang didop, direkod sebagai cakera KBr, menunjukan bahawa iodin tidak banyak mempengaruhi struktur CAB. CAB yang didop dengan 20% iodin mempunyai kekonduksian maksimum, iaitu $5.4 \times 10^{-10} \text{ Scm}^{-1}$ pada suhu bilik. Ketumpatan keadaan pada paras Fermi, jarak loncatan, tenaga loncatan dan ketumpatan pembawa cas, dikira berdasarkan model VRH, adalah masing-masing $2.31 \times 10^{23} (\text{eV})^{-1} \text{ cm}^{-3}$, $4.35 \times 10^{-8} \text{ cm}$, 0.013 eV dan $5.97 \times 10^{21} \text{ cm}^{-3}$.

CAB dan CAB yang didop dengan 20% iodin juga disepuh lindap pada 50°C-200°C dalam nitrogen ambien. Spektrum FTIR menunjukkan bahawa CAB mengalami rangkai silang pada 100°C, dan kekonduksian maksimum bernilai $4.56 \times 10^{-10} \text{ Scm}^{-1}$ pada 150°C. Sebagai bandingan, CAB yang didop dengan 20% iodin tidak mengalami rangkai-silang dan mempunyai kekonduksian minimum bernilai $1.13 \times 10^{-10} \text{ Scm}^{-1}$ pada 100°C.

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