

FTIR Spectroscopic Characterization of Cu(II) Coordination Compounds with Exopolysaccharide Pullulan and its Derivatives

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Pullulan is a water-soluble, extracellular neutral polysaccharide with a linear flexible chain of α -(1 \rightarrow 6)-linked maltotriose units, whose structure is intermediate between dextran and amylose structures because of the coexistence of both α -(1 \rightarrow 6) and α -(1 \rightarrow 4)-glycosidic linkages in a single compounds. In alkali solutions Cu(II) ion forms complexes with reduced low-molar pullulan (RLMP). The metal content and the solution composition depended on pH. The complexing process begins in weak alkali solution (pH>7), and involves OH groups in C(2) and C(3) or C(6) pullulan monomer units (α -D-glucopyranose). Complexes of Cu(II) ion with reduced low-molar pullulan were synthesized in the water solutions, at the boiling temperature and at different pH values (7.5–12). Fourier-Transform Infrared (FTIR) spectroscopic data of synthesized complexes are rare in literature. FTIR spectroscopic characterization (FTIR, LNT-FTIR, ATR-FTIR, deuterated FTIR and FTIR microspectroscopy) is now widely used to study the composition of complex carbohydrate systems, the molecular interactions, molecular orientation and conformational transitions of polysaccharides [1–4]. FTIR spectroscopic characterization (FTIR-spectrometer Bomem MB-100 (Hartmann&Braun Canada), connected with variable temperature cell Specac P/N-21525 for the LNT measurements), and FTIR microspectroscopy system (ATR-FTIR spectrometer Bruker Hyperion Tensor-27 in conjunction with a FTIR Bruker Hyperion-1000/2000 microspectroscopy attachment equipped with a 15 \times objective and a 250- μ m liquid N₂ cooled MCT detector, ATR objective GMBH, Germany) of Cu(II) ion complexes with RLMP (M_w 6000 g mol⁻¹) was done in this work. Samples of Cu(II) ion complexes with RLMP were deuterated 2 hours at room temperature in vacuum. Investigation of Cu(II) complexes by D₂O isotopic exchange is very sensitive method for OH group coordination, and related to hydrogen bond strength.

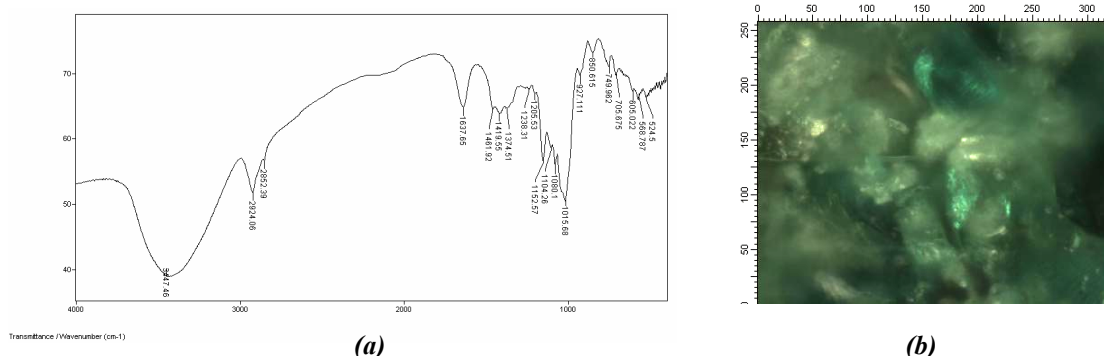


Fig. 1: FTIR spectrum of Cu(II)–RLMP complex synthesized at pH 7.5 (a); and FTIR microscopy image (250 μ m \times 300 μ m) (b)

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