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Quantitative analysis of aqueous methanol solution using hyperspectral imaging

Hyperspectral imaging is a spatio-spectral imaging technique that is capable of acquiring the electromagnetic spectrum at each spatial location in an imaging field of view. Since certain objects leave unique spectral profiles in the electromagnetic spectrum, hyperspectral imaging has gained in importance in a wide range of applications including material detection and identification. This work investigates the feasibility problem of estimating the methanol concentration of an aqueous methanol solution using hyperspectral imaging. Instead of adopting conventional techniques that are labor-intensive and typically require skilled staffs, we propose a real-time semi-automated method for methanol concentration estimation based on hyperspectral imaging. In particular, we image an aqueous methanol solution in the near-infrared region of the electromagnetic spectrum using a hyperspectral imaging system. The methanol concentration is then estimated from the acquired hyperspectral data by solving a constrained convex optimization problem. We demonstrated the feasibility of the proposed method using several sets of aqueous methanol solutions, each with five different concentrations. The methanol concentrations estimated using the proposed method were in good agreement with the expected concentrations.

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Track Classification: Other related topics