

## The relationship between the Hammett acidity and the decomposition of cefotaxime sodium in the solid state

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**Abstract:** It was of interest to correlate the solid-state acidity to the decomposition of a model drug namely cefotaxime sodium. Amorphous samples containing either an indicator probe (thymol blue) or a model drug (cefotaxime sodium) were prepared by freeze-drying. The prepared samples were characterized using XRPD and Karl Fischer titrimetry. The acidity in the solid state was measured using reflectance spectroscopy. The kinetics of hydrolysis of cefotaxime sodium was studied in solid state at 50°C in the Hammett acidity range of 8.12–8.61 and at constant ionic strength. The kinetics of decomposition of cefotaxime sodium in solution was also studied in basic media in the pH range of 7.9–8.9 at 50°C and at constant ionic strength. The degradation was monitored using a validated HPLC method. The hydrolysis was found to follow pseudo-first-order kinetics in solution and solid state. The results obtained showed that there is a good correlation between the Hammett acidity function and the base-catalyzed decomposition of cefotaxime sodium in the solid state. The Hammett acidity-rate profile for cefotaxime decomposition is similar to the pH-rate profile obtained in solution. The decomposition of cefotaxime sodium in the solid state was found to be sensitive to the ionic strength.