

# Real-time monitoring of polyvinylpyrrolidone eluting from dialyzer membrane

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## Introduction

Polysulfone(PS) dialysis membrane hydrophilized by blending polyvinylpyrrolidone(PVP) are wellknown to have excellent biocompatibility in clinical use. PS has some uncomfortable side effects, such as anaphylaxis and skin lesions, which are supposedly caused by PVP. Generally, method for measuring PVP eluted from dialysis membrane are X-ray photoelectron spectroscopy and colorimetric assay, however, ultraviolet(UV) spectroscopy offers an alternative approach for clinical analysis.

This approach is reagentless, thereby permitting real time analysis. In this study, we investigated to measure PVP directly by optical measurement

## Methods

PVP•K-90 (Wako chemicals, Ltd. Japan) was dissolved in physiological saline solution. The spectral measurement was performed by UV spectrophotometer and its spectrum was recorded in the 190-340 nm wavelength range.

The concentration of PVP was extracted from spectrum based on the absorption band and the actual concentration was also determined by autoanalyzer.

PVP sample was collected from the physiological saline passed through the blood side of PS dialyzer(PS1.6UW Fresenius, APS15SA AsahiKASEI). The concentration of PVP was measured by optical measurement and chemical analyzer.

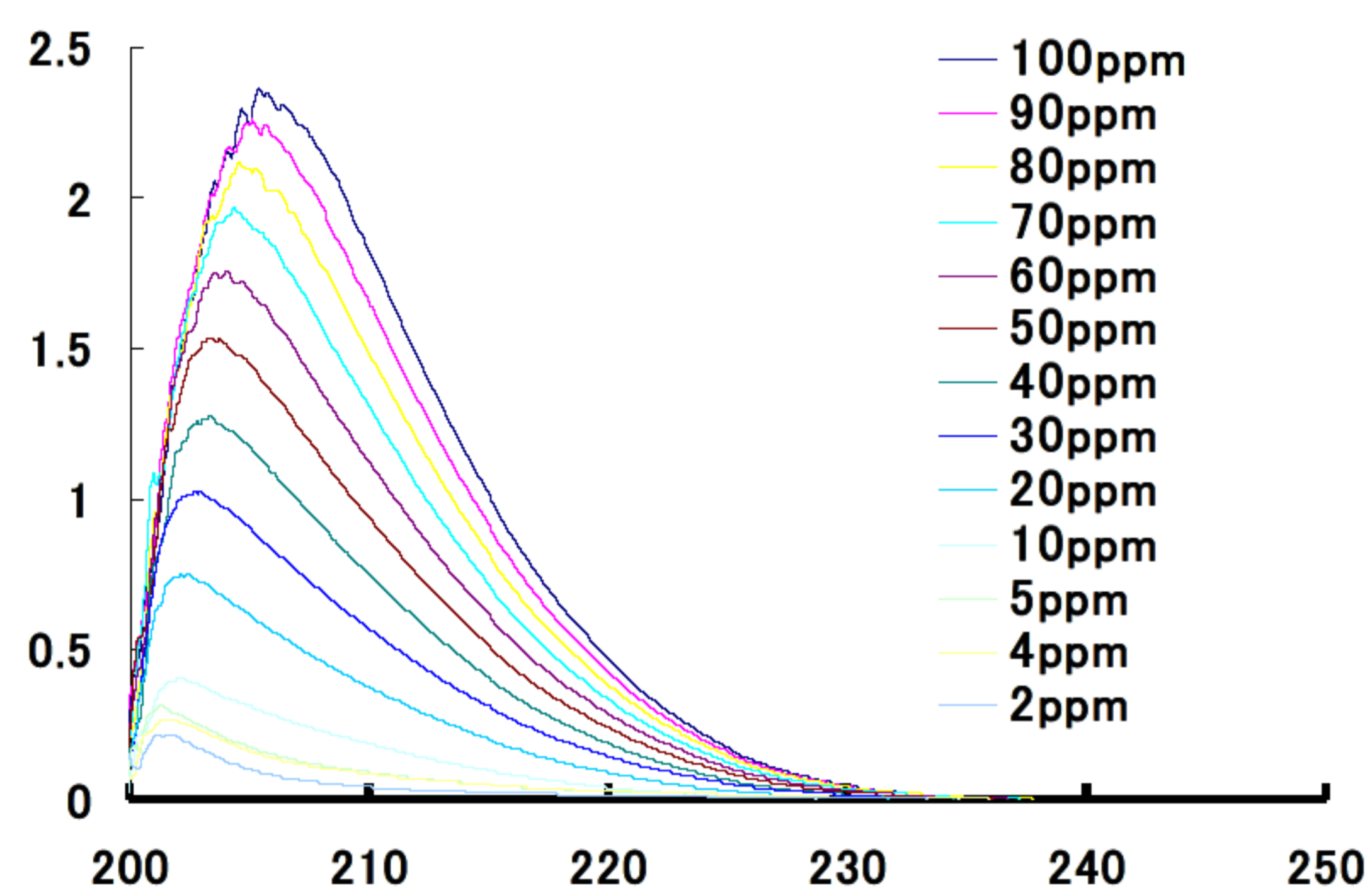


Fig.1 Absorbance spectrum of PVP-K90

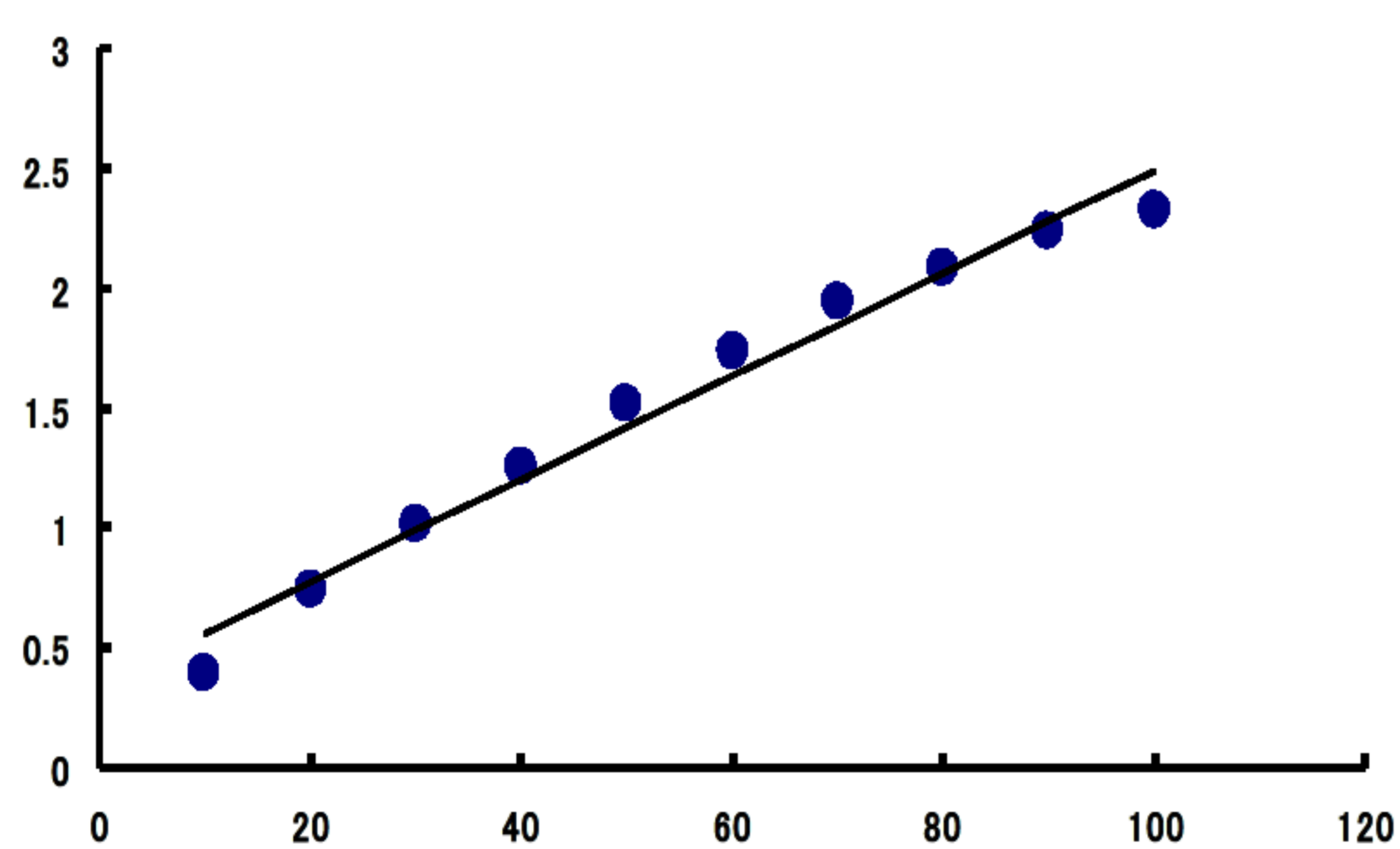


Fig. 2 The relation between PVP-K90 concentrations and peaks of optical density at 202-205 nm

## Results

The absorbance spectrum of PVP-K90 was showed in Fig.1. The absorption band of PVP•K90 was detected in the 200-230 nm and the peak of its spectra was from 202 nm to 205nm.

The predicted concentrations of PVP•K90 almost matched the actual concentrations. There were significant correlation between actual and predicted concentration of PVP•K90 ( $r=0.987$ ,  $P<0.001$ ) (Fig.2).

The spectra of PVP eluted from PS dialyzer were almost similar to those of PVP•K-90(Fig.3). There were significant correlation between predicted and actual concentrations of eluted PVP ( $r=0.991$   $P<0.001$ )(Fig.4).

## Conclusion

It is possible to determine the concentration of PVP eluted from PS dialyzer based on the spectral values using UV spectrophotometer.

This indicates that optical measurement proposed as a method for providing real time monitoring of eluted PVP during priming a dialyzer.

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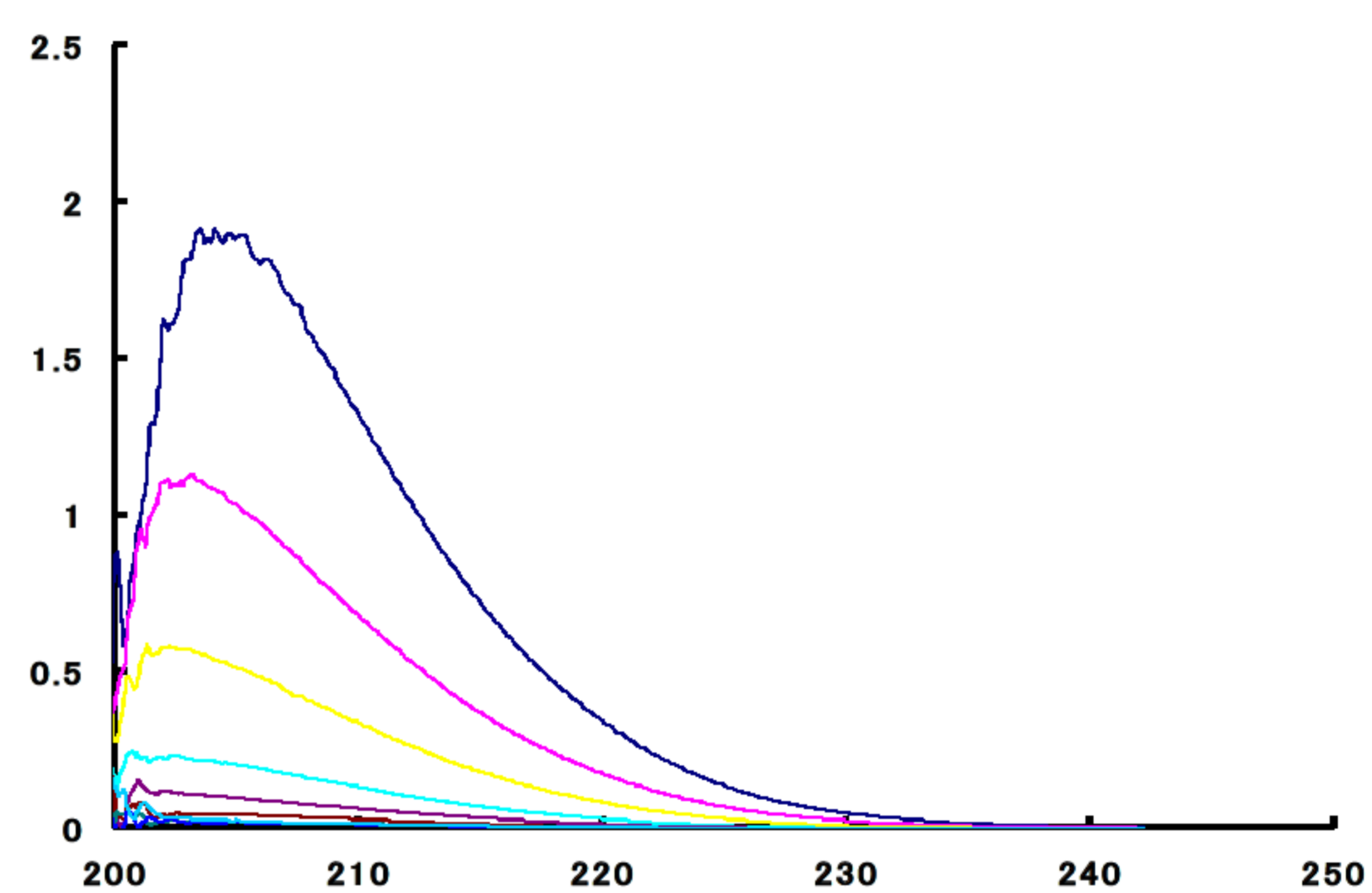


Fig. 3 Absorbance spectrum of PVP eluted from PS membrane

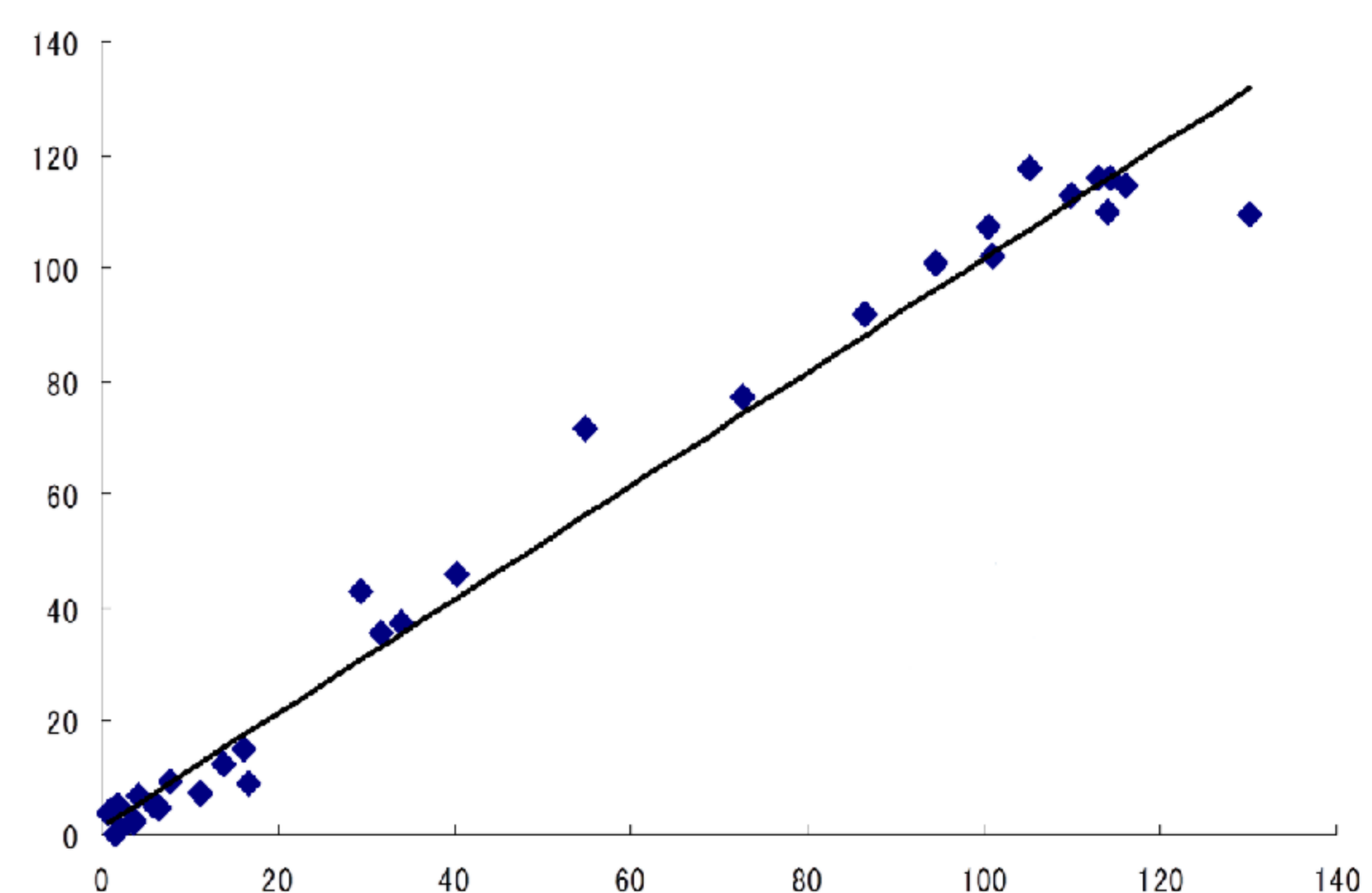


Fig.4 The relation between predicted and actual concentrations of eluted PVP from PS dialyzer

