Influence of Fluorescing Vitrinite on the Fluidity of some Bowen Basin coals.

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INTRODUCTION

Nearly three decades ago, in a study of the Wolgan coal from near Lithgow, New South Wales, CREANEY, PEARSON & MARCONI (1980) concluded that the presence of bituminous materials in the coal was responsible for variations in the coal's fluidity.

When we recently observed considerable variation in the Giesler fluidity among samples of coal from a Bowen Basin property, specifically from 5000 ddpm to 16000 ddpm, (Figure 1, below), we immediately thought that the presence of bitumen in the vitrinite could be the likely cause.

This poster is concerned with demonstrating (1) the fluoresence of the Detrovitrinite component, and (2) the variation in Giesler fluidity. The recognition of the fluoresence implies that there may be a geographic distribution to areas of higher and lower fluidity, as the concentration of bitumen in Detrovitrinite varies, and as the proportion of bright to dark vitrinite in the coal also varies.

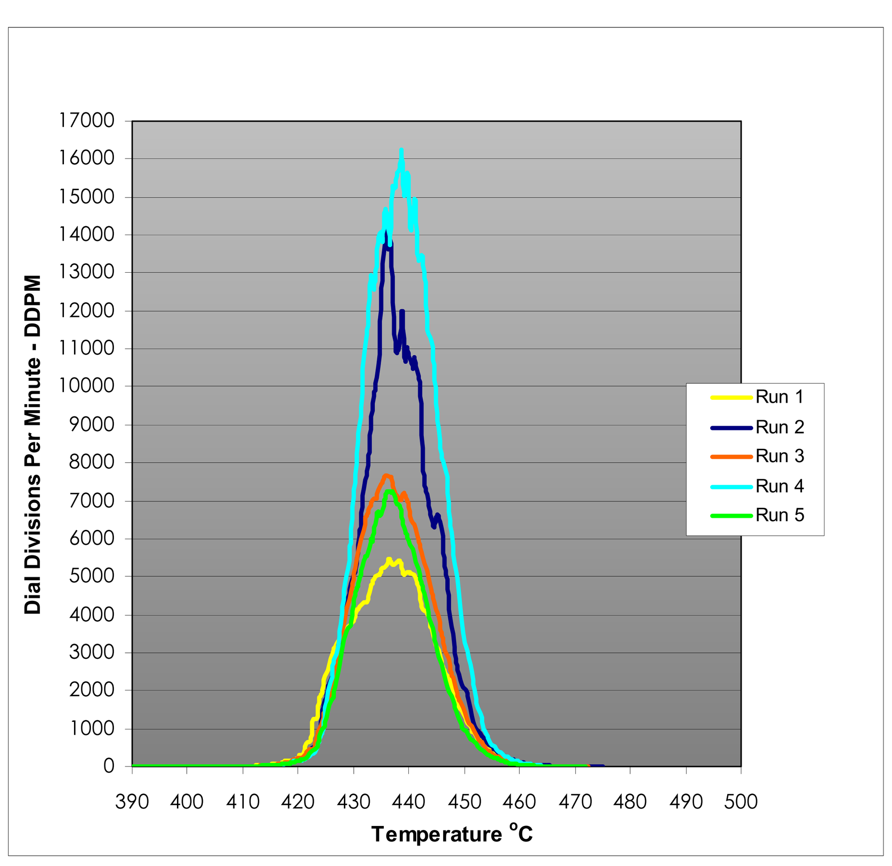


Figure 1 (Above). Five different runs measuring the Giesler Fluidity of a specific 5kg bag of clean coking coal. The variation in the fluidity peak (DDPM's) is a function of the proportion of Detrovitrinite to Telocolinite (dark vitrinite to bright vitrinite ratio).

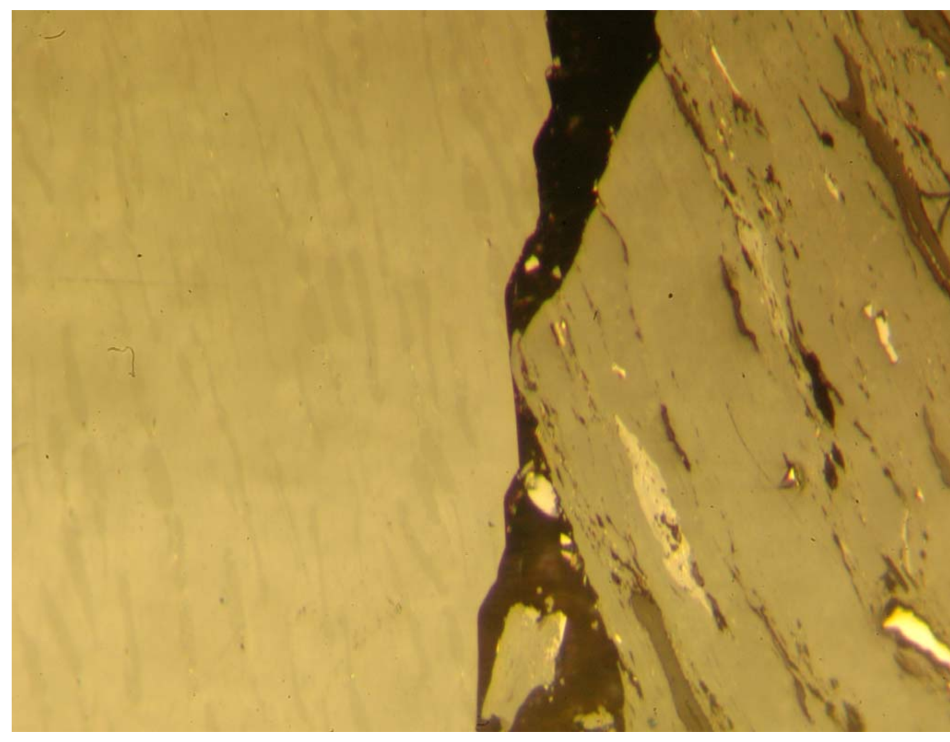


Figure 2 Photomicrograph of Telocollinite, on the left, and the darker, bitumen-bearing, Detrovitrinite, on the right. Romax = 0.89%

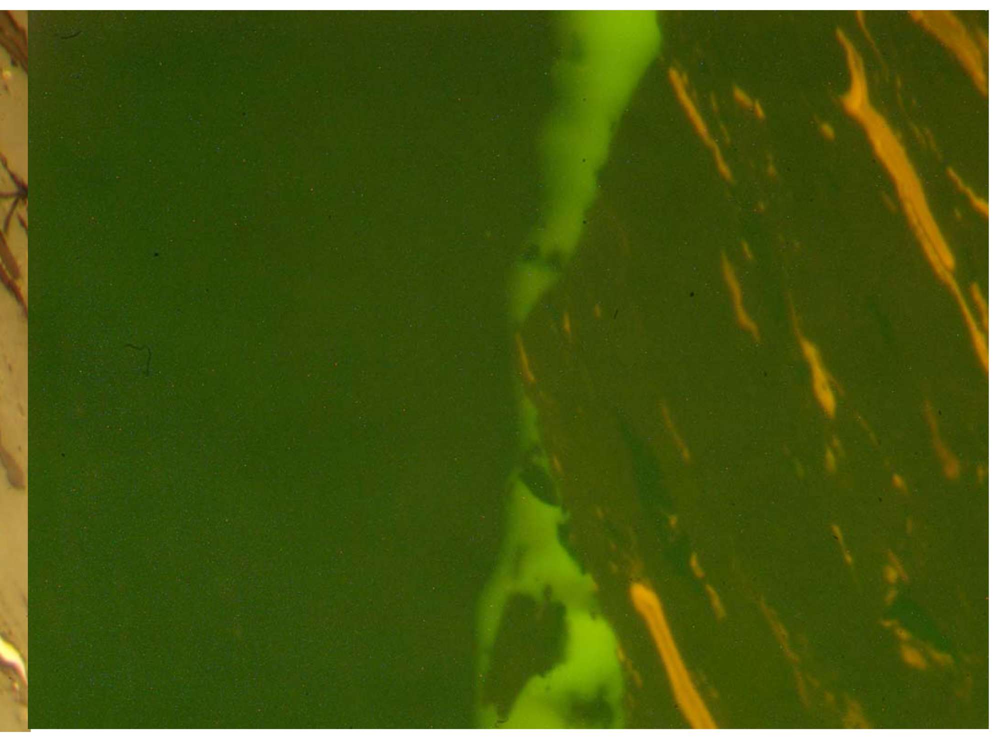


Figure 3. Same image as Figure 2, but showing fluoresence under blue light excitation. Note absence of fluoresence in the Telocollinite and Inertinite.

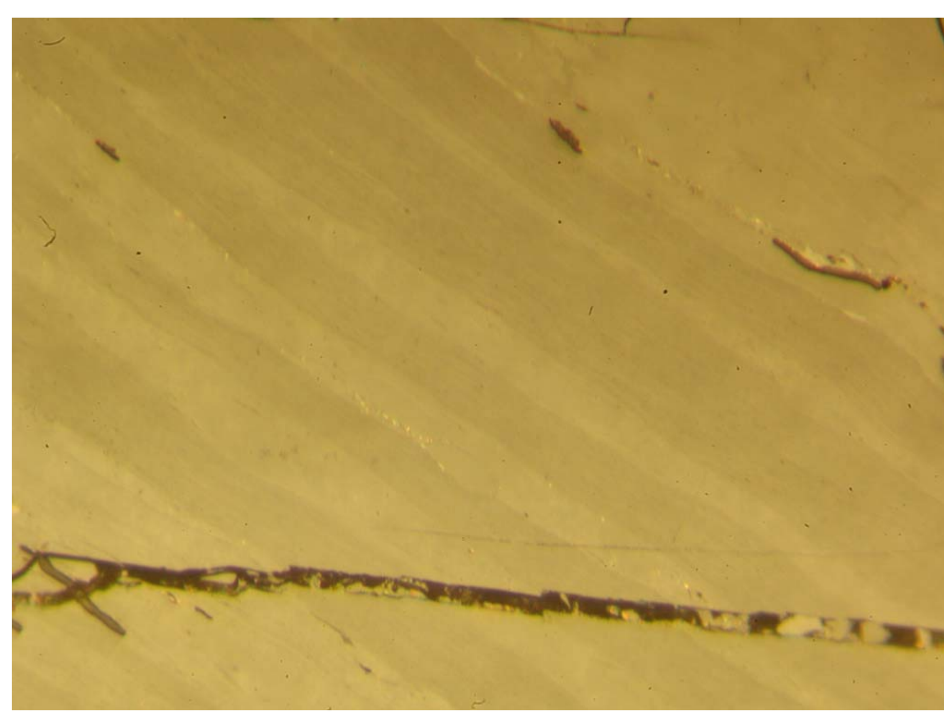


Figure 4. . Example of Banded Vitrinite showing alternating layering of bright and dark vitrinite.

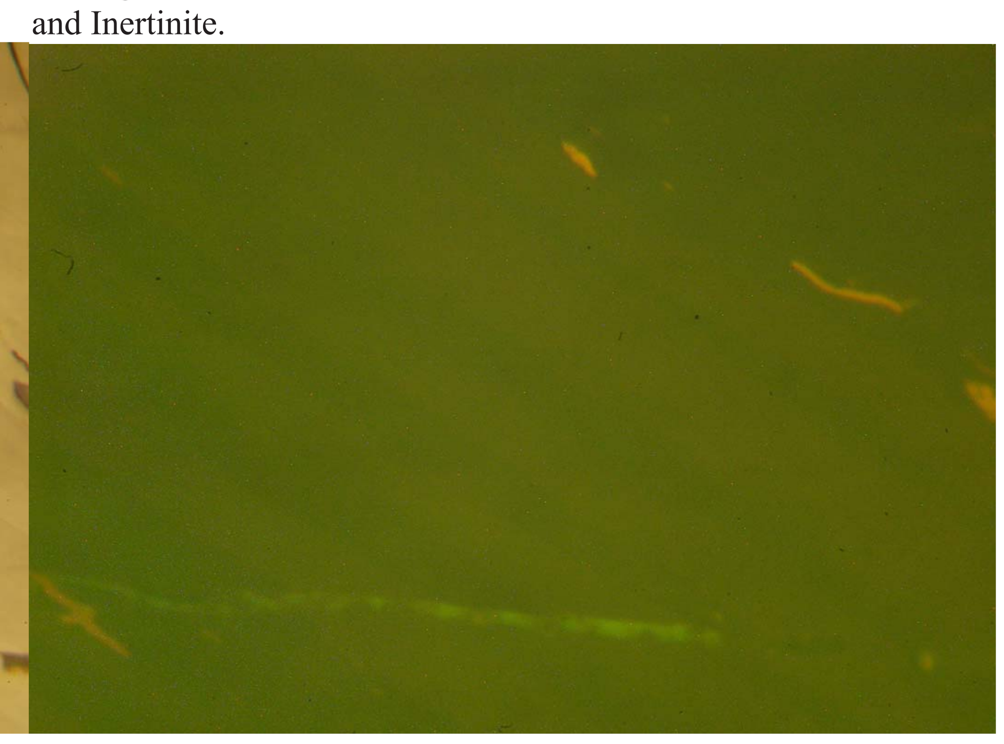


Figure 5. Same image as Figure 4, but showing fluoresence under blue light excitation. Note alternating bands of fluoresence and non-fluoresence.

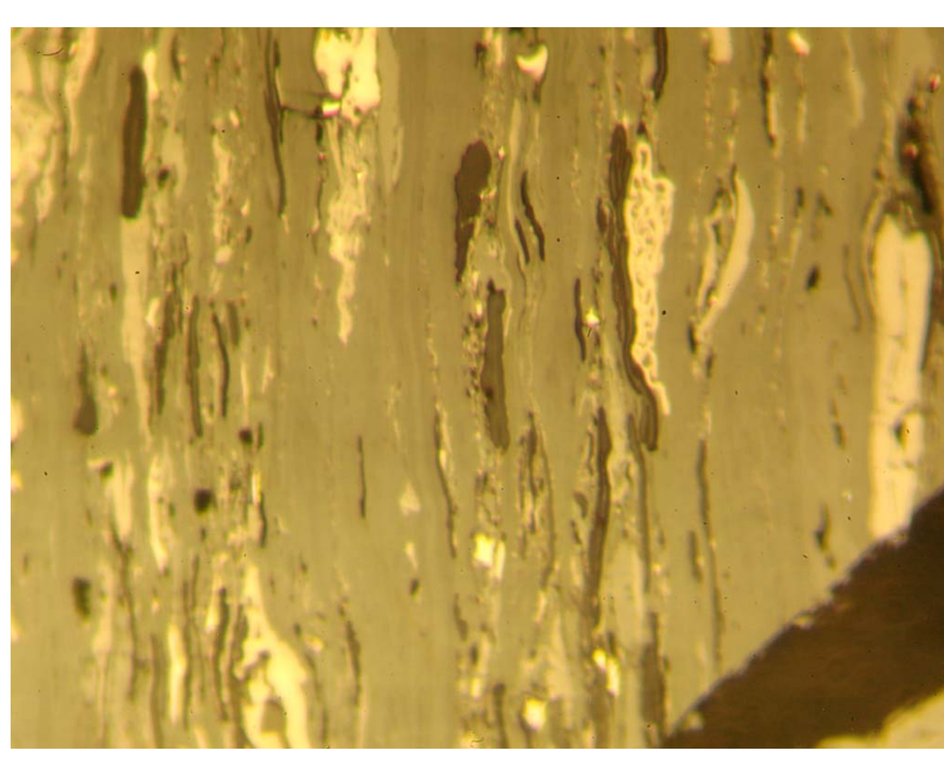


Figure 6. Photomicrograph of layered Detrovitrinite with inclusions of Inertinite and Liptinite. Romax = 0.89%

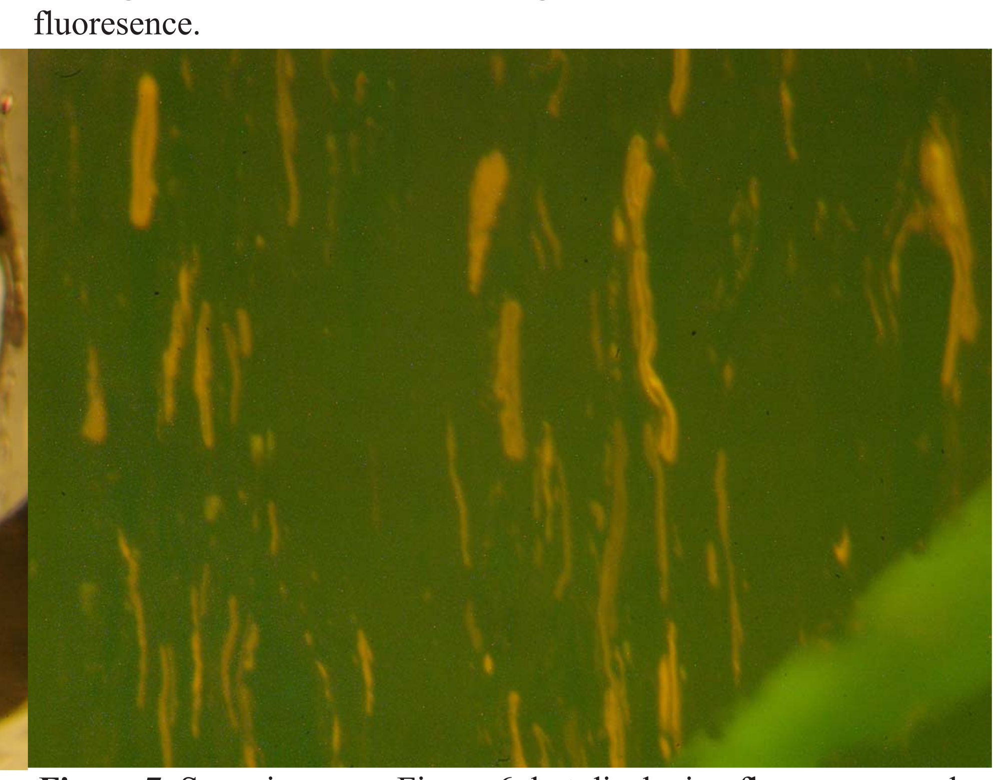
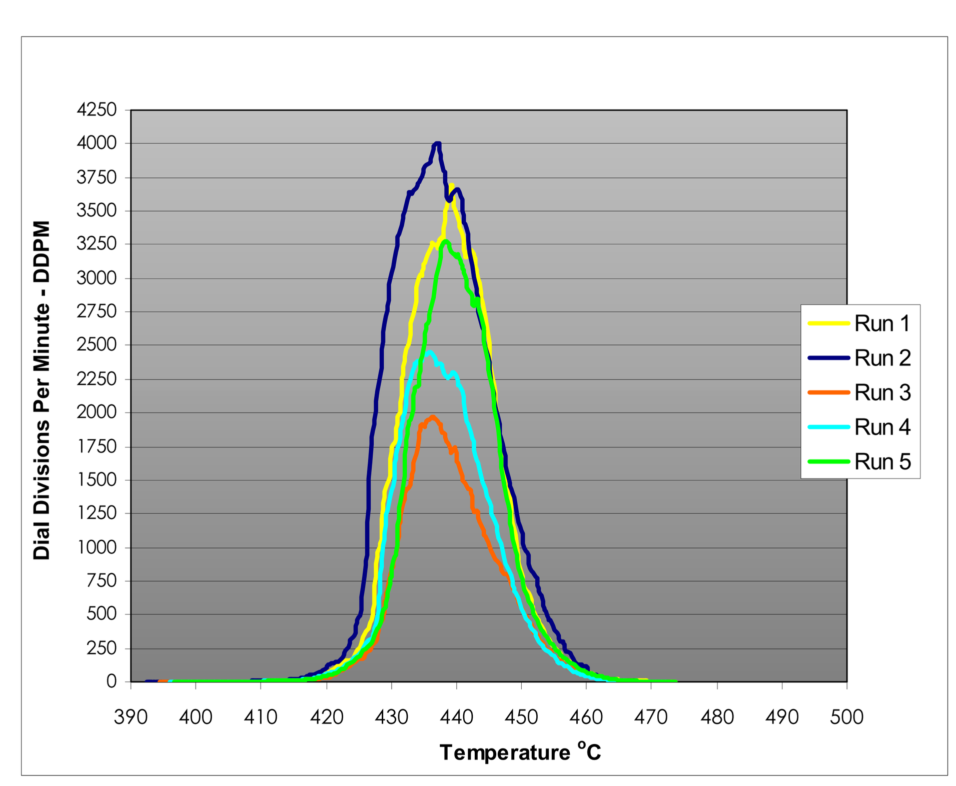


Figure 7. Same image as Figure 6, but displaying fluoresence under blue light excitation. Notice the orange Liptinite fluorescence; the brown vitrinite fluorescence, and the black, non-fluoresencing inertinite.

Figure 8 (Right). Five different runs measuring the Giesler Fluidity of a specific 5kg bag of clean coking coal. The variation in the fluidity peak (DDPM's) is a function of the proportion of Detrovitrinite to Telocolinite (dark vitrinite to bright vitrinite ratio).



Fluorescent Vitrinite

Liptinite macerals are hydrogen-enriched, and consequently fluoresce brightly, as is demonstrated by the three images of a Bowen Basin coal with a Romax reflectance of 0.89%.

Among some Pennsylvannian-age, high volatile coals from West Virginia, that contain only about 8% Liptinite, there are very high Giesler fluidities - in excess of 50,000 DDPM and as high as 170,000 DDPM, see Figure 9, below. This is caused by large amounts of bitumen that is soaked into the vitrinite structure. There is a correspondingly large display of fluorescence by the vitrinite see Figure 10, below.

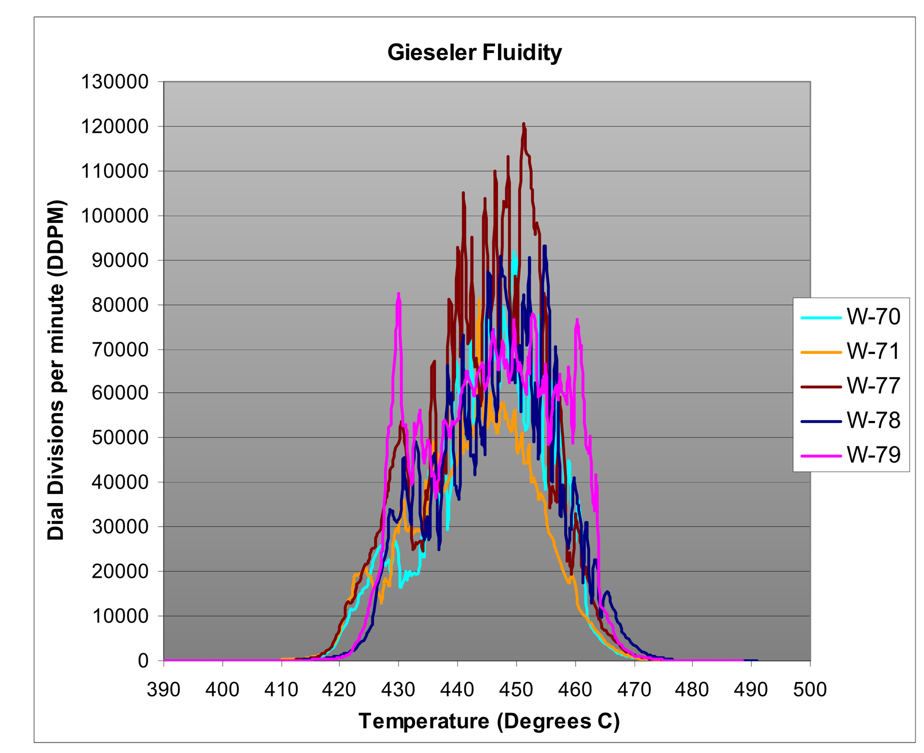


Figure 9 (Above). Giesler Fluidity of five different samples. The variation in the fluidity peak (DDPM's) is a function of the proportion of Detrovitrinite to Telocolinite (dark vitrinite to bright vitrinite ratio).

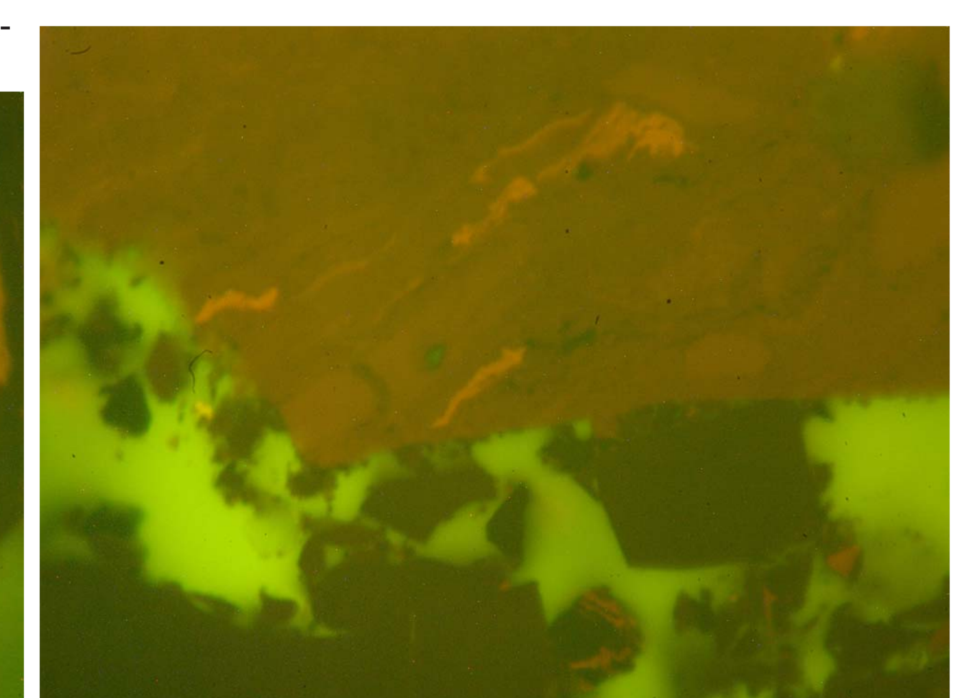


Figure 10 (Above). Fluoresence of West Virginia Appalachian coal, five examples of its Giesler fluidity are shown above. In the image, the yellowy fluoresence of whispy Liptinite is enclosed in an orange fluorescing vitrinite. Non fluorescing other macerals are present across the bottom of the image. The binder has a greeny colour.

CONCLUSIONS

There are unexplained variations of fluidity in some Bowen Basin coals. We have documented in other areas that such variations are caused by bitumen-bearing vitrinite. This type of vitrinite fluoresces. Here we demonstrate fluorescence of vitrinite in some Bowen Basin coals, and suggest that this may be the cause of Giesler fluidity fluctuations.

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