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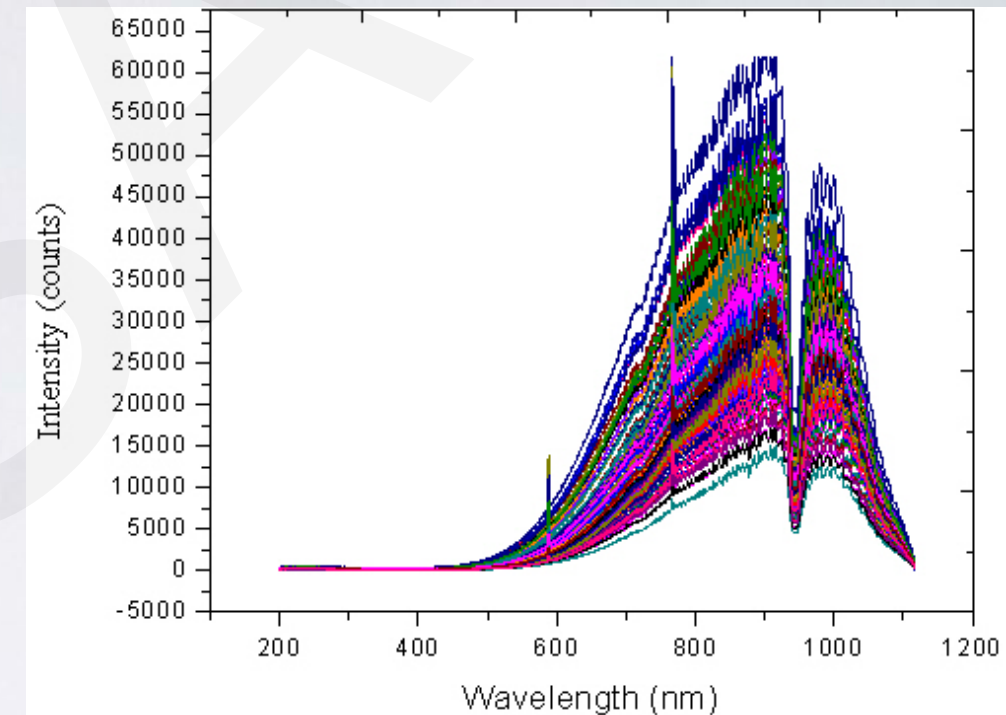
Coal type identification based on the emission spectra of a furnace flame

Key words:

Coal type identification, Flame emission spectra, Alkali atomic spectra, Temperature compensation

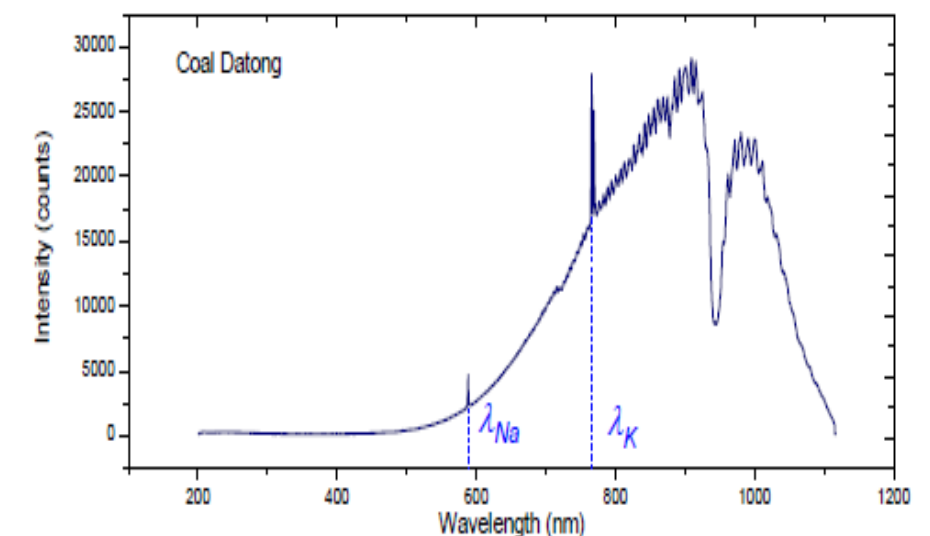
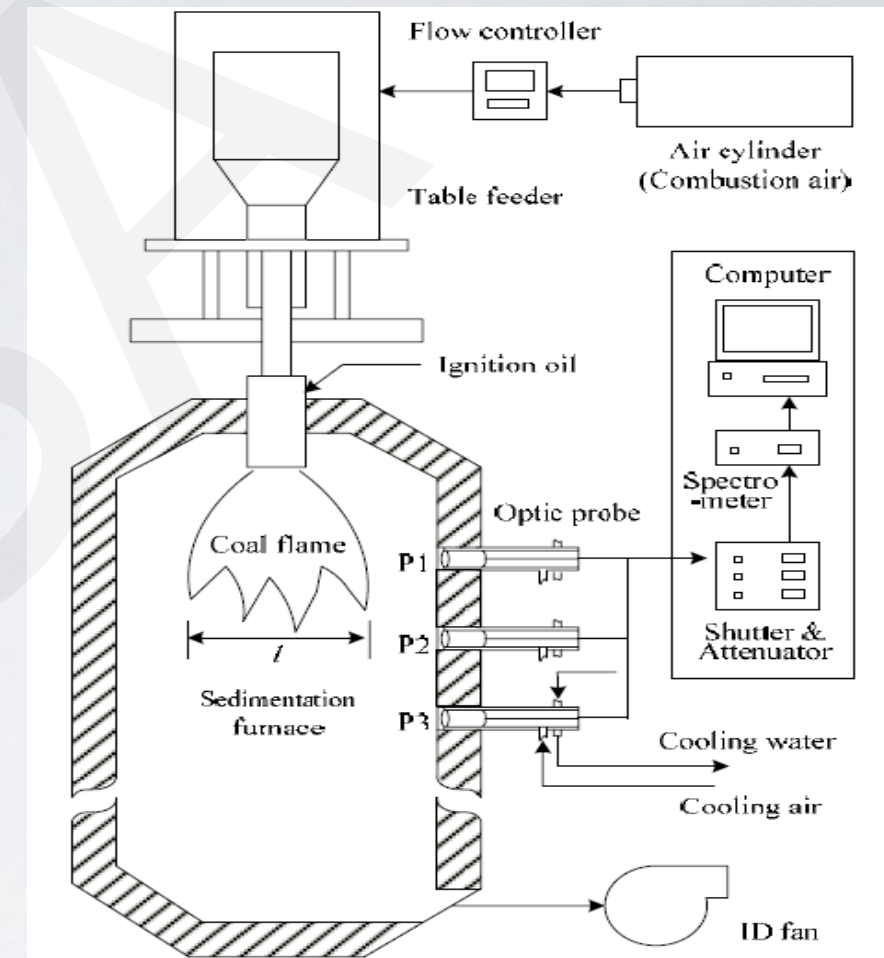
BACKGROUND

- In the field of boiler burning optimization control, the technology of measurement in furnace is very key but develops slowly, and the online detection and identification of coal species is one of its difficulties.
- This paper proposed a novel coal species online identification method based on the flame glowing mechanism.
- The spectrum of a flame is more stable and consistent than other characteristics, but current research on flame emission spectrometry has only focused on the measurement of flame temperature.
- With low cost, high accuracy, and easily operated spectrometers available recently, the research on the flame spectrum is easier.



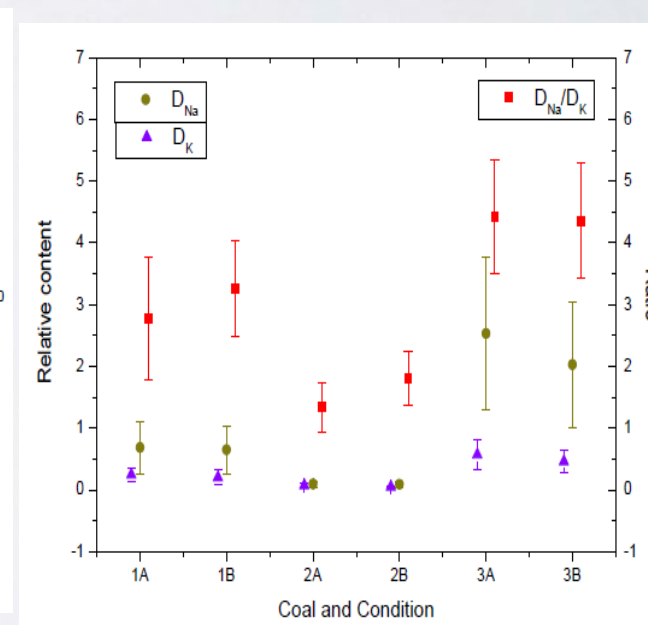
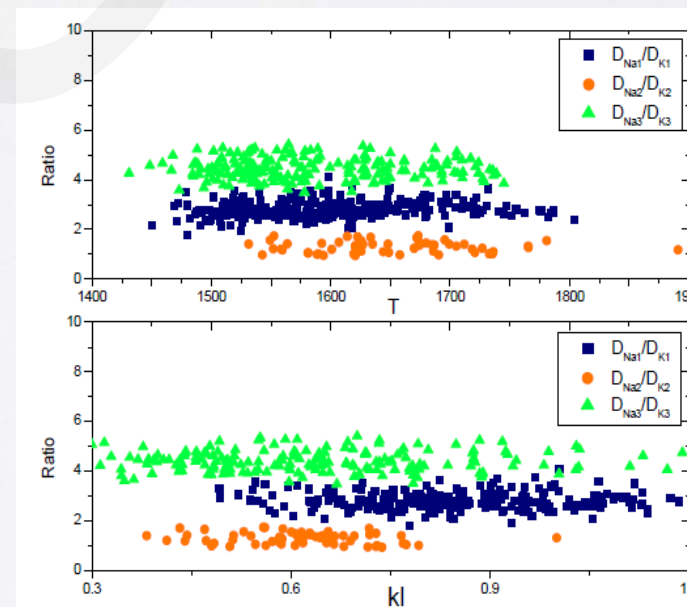
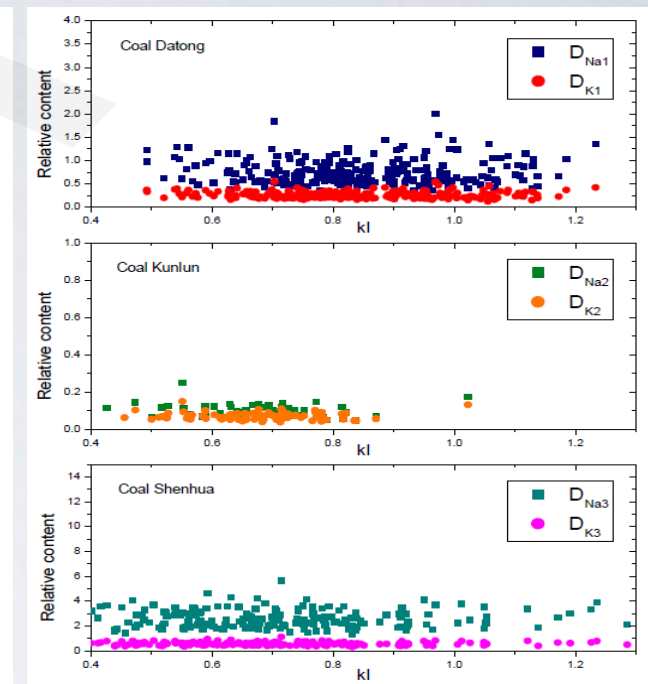
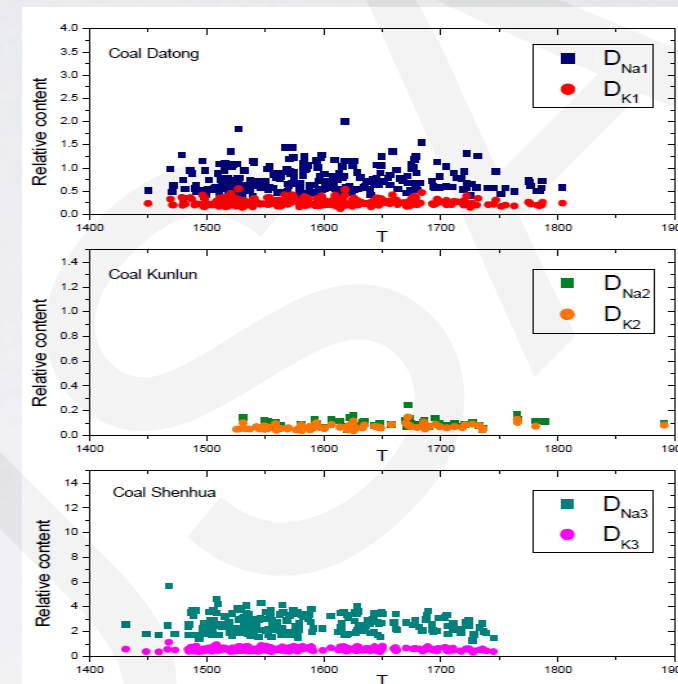
METHOD

- A sedimentation furnace test system was used to test the flame spectrum.
- According to Planck's law of thermal radiation, the shape and size of spectral curves embody the main messages of temperature, emissivity and soot density.
- Signal peaks are clearly visible at the two wavelengths of 589 nm and 766.5 nm. These are the atomic emission spectra of Na and K atoms in the flame.
- The size of each peak measured above the continuous spectrum represents the element concentrations in the flame, and thus relates to the coal type.



RESULTS AND CONCLUSIONS

- Three coal types of different ranks were tested, Na and K are typical elements vaporized in particles of burning coal.
- The Na and K content vaporized in the flame is related to the flame temperature. After temperature compensation, the atomic emission spectra of K and Na are diagnostic properties of the coal type.
- After compensation for temperature and the density of soot particles, the relative strength of the Na and K signals and the ratio of one to the other uniquely match the type of coal burnt in various conditions.



PERSPECTIVES & APPLICATION

- The resonance spectrum line strength has a definite relationship with the corresponding content of the element of Na, K, and Li alkali metal species in coal-fired flame.
- Collected by the fiber spectrometer, the flame spectrum data in key wavelength area is used to identify the various kinds of coal online. The system is simple and reliable, can achieve real-time identification.

