

GSA Data Repository Item

FORMATION OF TAR-LIKE DEPOSITS

The impact of the hot pyroclastic density current upon the vegetation may have a range of effects depending on both the availability of oxygen and also temperature. When plant tissues, including those containing cellulose, hemicellulose and lignin, are subjected to temperatures above 200°C, pyrolysis reactions occur. The decomposition of each of these occurs at different rates but significant liquids are produced between 300 and 400°C (Kawamoto et al., 2005) with major tar production above 350°C (Schröder, 2004) but maximum yields at 500°C (Bridgewater, 1999). These liquids will often solidify when cooled. Charcoal is a solid residue that forms in the absence of oxygen and is essentially, therefore a pyrolysis residue. The temperatures reached during the charring process are also important. Cellulose, which is a fundamental building block of all plant cells and accounts for 70% of the cell wall in woody tissues, is relatively stable up to 250°C. Between 250 and 325 °C wood cellulose begins to break down, generating flammable gases and decomposes >350°C (Schröder, 2004). In contrast, lignin, which makes up the remaining 30% of the cell wall in woody tissues, is more stable and resistant to thermal degradation, and will tend to survive as a char product. Between 300 and 325 °C the layering in the cell walls is lost, giving a homogenized cell wall (Scott, 2000) that can be observed microscopically.

REFERENCES CITED

Bridgewater, A.V., 1999. Principles and practice of biomass fast pyrolysis processes for liquids: *Journal of Analytical and Applied Pyrolysis*, v. 51, p. 3-22.

Kawamoto, K., Hayashi, H., Huda, M., Qiao, W.M., and Mochida, I., 2005. Moulded charcoal prepared from bark charcoal and wood pyrolysis tar: Mokuza Gakkaishi, v. 51, p. 402-407.

Schröder, E., 2004. Experiments on the pyrolysis of large beechwood particles in fixed beds: Journal of Analytical and Applied Pyrolysis, v. 71, p. 669-694.

Scott, A.C., 2000, The Pre-Quaternary History of Fire: Palaeogeography, Palaeoclimatology, Palaeoecology, v. 164, p. 281-329.

Table DR1. Reflectance under oil of charcoal particles.

Specimen	Min Ro	Min Particle Ro	Mean Ro	Max Ro	Max Particle Ro
MVO342	0.29	0.91	1.16(n=40)	1.46	1.34
MVO444	0.29	0.47	0.97(n=35)	1.52	1.31
MVO662	0.13	0.25	0.72(n=100)	1.77	1.35
All Specs			0.86(n=175)	SD0.41	