

Preliminary magnetic biomonitoring study of the spatial distribution of roadside pollution using *Cryptomeria japonica* tree bark

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Magnetic biomonitoring methods have been shown to be effective for monitoring roadside pollution. Most such studies have focused on tree leaves and only a few systematic magnetic investigations have reported on tree barks. However, tree barks could be an effective candidate for biomonitoring because tree barks can be sampled at any height above the ground. Our aim is test the efficiency of using the magnetic properties of *Cryptomeria japonica*, Japanese cedar tree, bark for monitoring roadside pollution and estimating the tree-dimensional distribution of roadside pollution. One bark sample was collected from the road-facing side of the tree and second from the forest-facing side. The samples were collected at heights of 0.5, 1.0, and 1.5 m from the ground at 18 sites along a local road in Suzu-city, Ishikawa, resulting in 108 samples in total. Stepwise isothermal remanent magnetization(IRM) acquisition and subsequent alternative field demagnetization tests indicate that the main magnetic minerals attached to the bark are pseudosingle-domain(PSD) magnetite and maghemite. The maximum saturation IRM intensities occur near the roadside and the intensities decrease rapidly by ~2 m from the roadside. Also, the higher the height above the ground, the lower is the observed SIRM intensity. Therefore, likely the magnetic minerals in tree barks are derived from passing vehicles. The results show that environmental magnetic measurements on tree barks are an effective method for estimating roadside pollution in three-dimensional space.

Keywords: magnetic biomonitoring, roadside pollution, tree bark, Ishikawa