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Changes in sample composition during experiments using the 'wire-loop' technique

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ATTEMPTS to minimize changes in the bulk composition of samples during experiments at high temperatures have led in recent years to the development of the wire-loop technique. The two papers by Donaldson and by Corrigan and Gibb to which this is a preface detail the extents of these changes and evaluate the factors controlling them with respect to basaltic melts.

These two studies of the use of wire-loop sample containers for experiments on basaltic melts were conceived and executed independently and it was only after the manuscripts reached Professor W. S. MacKenzie that we became aware of each other's work. Fortuitously, the two studies do not overlap to any great extent and are, in fact, complementary with Corrigan and Gibb having worked at a fixed temperature and examined the effects of wire type, sample mass, and time on Fe and Na losses from the sample, whereas Donaldson has studied the effects of superheat, oxygen fugacity, and time. In addition Donaldson's study utilizes a type of wire ($Pt_{80}Rh_{20}$) not covered by the work of Corrigan and Gibb who were concerned primarily with Ag-Pd alloy wire. Where the two projects involved experiments carried out under similar conditions the results from the two laboratories are in remarkably good agreement; a fact that may reflect both the precision and simplicity of the wire-loop technique. Together the studies emphasize the value of the technique in minimizing Fe loss but, at the same time, stress the possible risks of serious losses of alkalis. In addition they provide comprehensive data on the chemical changes to be expected during experiments on the melting and crystallization of basaltic compositions under a wide range of conditions.

Composition changes in a basalt melt contained in a wire loop of $Pt_{80}Rh_{20}$: effects of temperature, time, and oxygen fugacity

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SUMMARY. Losses of FeO, Na_2O, and K_2O from an alkali olivine basalt melted above the liquidus temperature in $Pt_{80}Rh_{20}$ wire loops are reported as a function of temperature, time, and P_{O_2}. Increasing temperature and decreasing P_{O_2} increase the losses. Compared to open capsules the wire-loop container reduces FeO loss to a minimum but may exacerbate Na_2O loss. Nonetheless for most types of experiment involving melt these losses are acceptable.

NOBLE-METAL wire loops are used as sample containers for basalt melting and crystallization studies in one-atmosphere gas-mixing furnaces (e.g. Weill and McKay, 1975; Lofgren *et al*., 1974), in order to reduce Fe loss from the sample and also to increase contact between the sample and the gas atmosphere. Losses of FeO in melting runs of 1-24 hours duration were reported by Donaldson *et al.* (1975) to be 2.5-5% of the initial amounts. They noted, however, that Na_2O loss was greater, particularly at low oxygen fugacity. Rates of FeO, Na_2O, and K_2O losses from several basalts run in open Mo, Pt, and AgPd alloy capsules have been reported by Bow *et al.* (1976), but no such data exist for the wire-loop sample container. Neither have the quantitative effects of P_{O_2} and superheat on these rates been determined.