Fractional differentiation of silicate minerals during oil shale processing: A tool for the prediction of retort temperatures

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The pyrometamorphism of Green River oil shale, in order to pyrolize kerogen for the extraction of oil, produces a mineralogical sequence with similar silicate structures to natural magmas. Bowen's reaction series is a sequence by which igneous minerals crystallize to from cooling magmas. Conceived to differentiate natural magmas, mineralogical and structural similarities exist between Bowen's reaction series and the minerals that form during the processing of oil shale. The mineral suites created by either surface retorting or *in situ* processing of oil shale, although differing from natural magmas by the presence of excess calcium, contain important parallels to their natural counterparts and are both byproducts of the polymerization of the silica tetrahedra. Oil shale processing forms the reaction series monticellite; akermanite-gehlenite; augite-diopside; actinolite-tremolite; clintonite, a Ca-analog to biotite. Using silicate structure equivalents and the resultant temperature regimes that produced the minerals, a modified oil shale reaction series, modeled after Bowen's Reaction Series, can serve as a tool to interpret minerals and temperatures generated during oil shale processing.