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An evolutionary system of mineralogy, Part V: Aqueous and thermal alteration of planetesimals (~4565 to 4550 Ma)

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Abstract

Part V of the evolutionary system of mineralogy explores phases produced by aqueous alteration, metasomatism, and/or thermal metamorphism—relicts of ancient processes that affected virtually all asteroids and that are preserved in the secondary mineralogy of meteorites. We catalog 166 historical natural kinds of minerals that formed by alteration in the parent bodies of chondritic and non-chondritic meteorites within the first 20 Ma of the solar system. Secondary processes saw a dramatic increase in the chemical and structural diversity of minerals. These phases incorporate 41 different mineral-forming elements, including the earliest known appearances of species with essential Co, Ge, As, Nb, Ag, Sn, Te, Au, Hg, Pb, and Bi. Among the varied secondary meteorite minerals are the earliest known examples of halides, arsenides, tellurides, sulfates, carbonates, hydroxides, and a wide range of phyllosilicates.

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