‘Hydrocerussite’ puzzle

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‘Hydrocerussite’ is a well-known mineral from many different deposits around the world. Given that ‘hydrocerussite’ has been studied by a number of people and many papers in different fields written, it may be assumed that this is a well-defined and well-known mineral. However there is no single-crystal X-ray data on natural or synthetic ‘hydrocerussites’ available to date. Structural studies of Pb hydroxocarbonates are challenging due to a number of factors, including X-ray absorption by heavy Pb2+ cations with diffuse electron shells, strong pseudosymmetries, poorly defined weak superstructure reflections and invariably plate morphology of crystals. Many of previously identified as hydrocerussite samples from several localities were investigated. Nice crystals are known from Långban mine - type locality for this mineral. Surprisingly, most of ‘hydrocerussites’ appeared to be plumbonacrite after careful evaluation by the means of single-crystal X-ray diffraction. New mineral grootfonteinite was discovered in ‘hydrocerussite’ material from Kombat mine. Unusual green ‘hydrocerussite’ from Merehead quarry is also a new mineral somersetite. The crystal structure of somersetite is unique and consists of electroneutral [Pb3(OH)2(CO3)2]0 blocks identical to those in well-defined hydrocerussite and electroneutral [Pb5O2(CO3)3]0 blocks with the structure derivative from plumbonacrite. In multicoloured crystals somersetite forms mutual intergrowths with plumbonacrite (Figure 1). In a similar way crystal structure of ‘hydrocerussite’ from Lavrion slags is formed from [Pb3(OH)2(CO3)2]0 hydrocerussite and [NaPb2(OH)(CO3)2]0 abellaite blocks. Pb content is very similar in all of the described lead hydroxocarbonate minerals and reliable identification can be achieved by X-ray methods mostly. All of the structural architectures of hydrocerussite-related minerals are organized from similar lead-carbonate modules stacked in a different ways and resulting in a unique structure type for each mineral.

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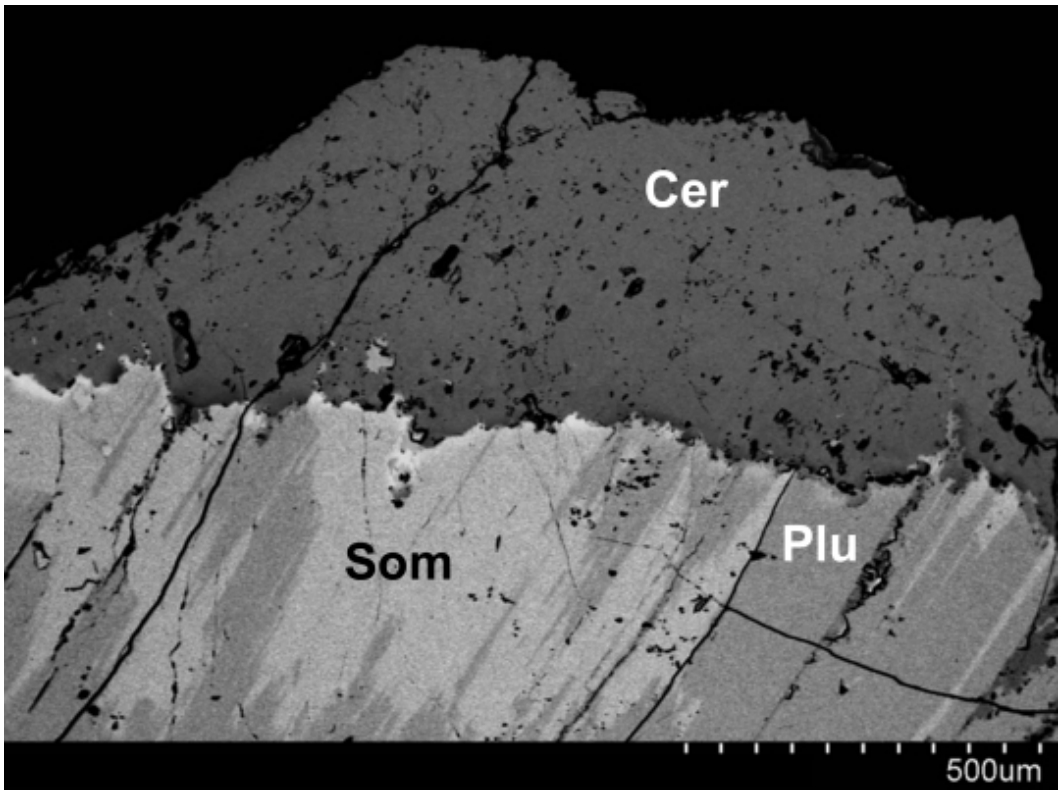
Figure 1. SEM image showing mutual intergrowths of somersetite (light grey) with plumbonacrite (darker grey) and cerussite (very dark) in the rim.



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