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Introduction: At the time of publication of New Views of the Moon [1], it was thought that the Moon was bone dry with less than about 1 ppb H2O. However in 2007, initial reports at the 38th Lunar and Planetary Science Conference speculated that H-species were present in both apatites [2] and pyroclastic volcanic lunar glass beads [3]. These early reports were later confirmed through peer-review [4-8], which has motivated many subsequent studies on magmatic volatiles in and on the Moon within the last decade. Some of these studies have cast into question the post-Apollo view/synthesis on the current state of 1) apatite compositions (volatile abundances and isotopic compositions); 2) nominally anhydrous mineral phases (moderately to highly volatile); 3) volatile (moderately to highly volatile) abundances in and isotopic compositions of lunar pyroclastic glass beads; 4) volatile (moderately to highly volatile) abundances in and isotopic compositions of lunar basalts; 5) volatile (moderately to highly volatile) abundances in and isotopic compositions of melt inclusions; and finally 6) experimental constraints on mineral-melt partitioning of moderately to highly volatile elements under lunar conditions. We anticipate that each section will summarize results since 2007 and focus on new results published since the 2015 Am Min review paper on lunar volatiles [9].

The next section will discuss how to use sample abundances of volatiles to understand the source region and potential caveats in estimating source abundances of volatiles. The following section will include our best estimates of volatile abundances and isotopic compositions (where permitted by available data) for each volatile element of interest in a number of important lunar reservoirs, including the crust, mantle, KREEP, and bulk Moon. The final section of the chapter will focus upon future work, outstanding questions, and any insights on the types of samples or experimental studies that will be needed to answer these questions.

Chapter changes since the NVM II 2016 Workshop: In the months following the 2016 NVM II workshop, we were informed by the steering committee that the request to have a stand alone chapter on stable isotope was denied. Consequently, we have decided to cover the topic of volatile stable isotopes in our chapter and include a synthesis/review of new stable isotope data where relevant. There were no additional major changes to report on the contents of this chapter.