Critical V2O5/TeO2 ratio inducing abrupt property changes in vanadium tellurite glasses

Transition metal containing glasses have unique electrical properties and are therefore often used for electrochemical applications, such as in batteries. Among oxide glasses, vanadium tellurite glasses exhibit the highest electronic conductivity and thus the high potential for applications. In this work, we investigate how the dynamic and physical properties vary with composition in the vanadium tellurite system. The results show that there exists a critical V2O5 concentration of 45 mol %, above which the local structure is subjected to a drastic change with increasing V2O5, leading to abrupt changes in both hardness and liquid fragility. Electronic conductivity does not follow the expected correlation to the valence state of the vanadium as predicted by the Mott-Austin equation but shows a linear correlation to the mean distance between vanadium ions. These findings could contribute to designing optimum vanadium tellurite compositions for electrochemical devices. The work gives insight into the mechanism of electron conduction in the vanadium tellurite systems. (Graph Presented).
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