

Transmission electron microscopy of the fine-grained matrix in the observed meteorite fall Winchcombe

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Mighei-type (CM) carbonaceous chondrites show a wide range of components with different formation histories and document the compositions and evolution of the earliest solids of the protoplanetary disk [1]. The Winchcombe meteorite, that fell on 28 February 2021, was classified as CM2 consisting of various differently altered lithologies [2]. The mineralogy and petrography of the nanoscale Winchcombe matrix was analysed by transmission electron microscopy (TEM) techniques using three electron-transparent lamellae from the matrix and lithology H. Our results show that the chemistry of nanoscale TCIs (tochilinite-cronstedtite intergrowths) gives similar petrologic types as the ones acquired on larger TCIs by SEM. However, primitive areas like GEMS-like particles (glass with embedded metal and sulphides) are also observed, which are considered to be the building blocks of an ideal CM 3.0 matrix [3, 4].

[1] Suttle, M. et al. (2021) GCA 299, 219–256. [2] King, A. et al. (2022) Sci. Adv. 8, 1-17. [3] Lier, J. et al. (2025) MAPS 60, 2149-2165. [4] Leroux, H. et al. (2015) GCA 170, 247–265.