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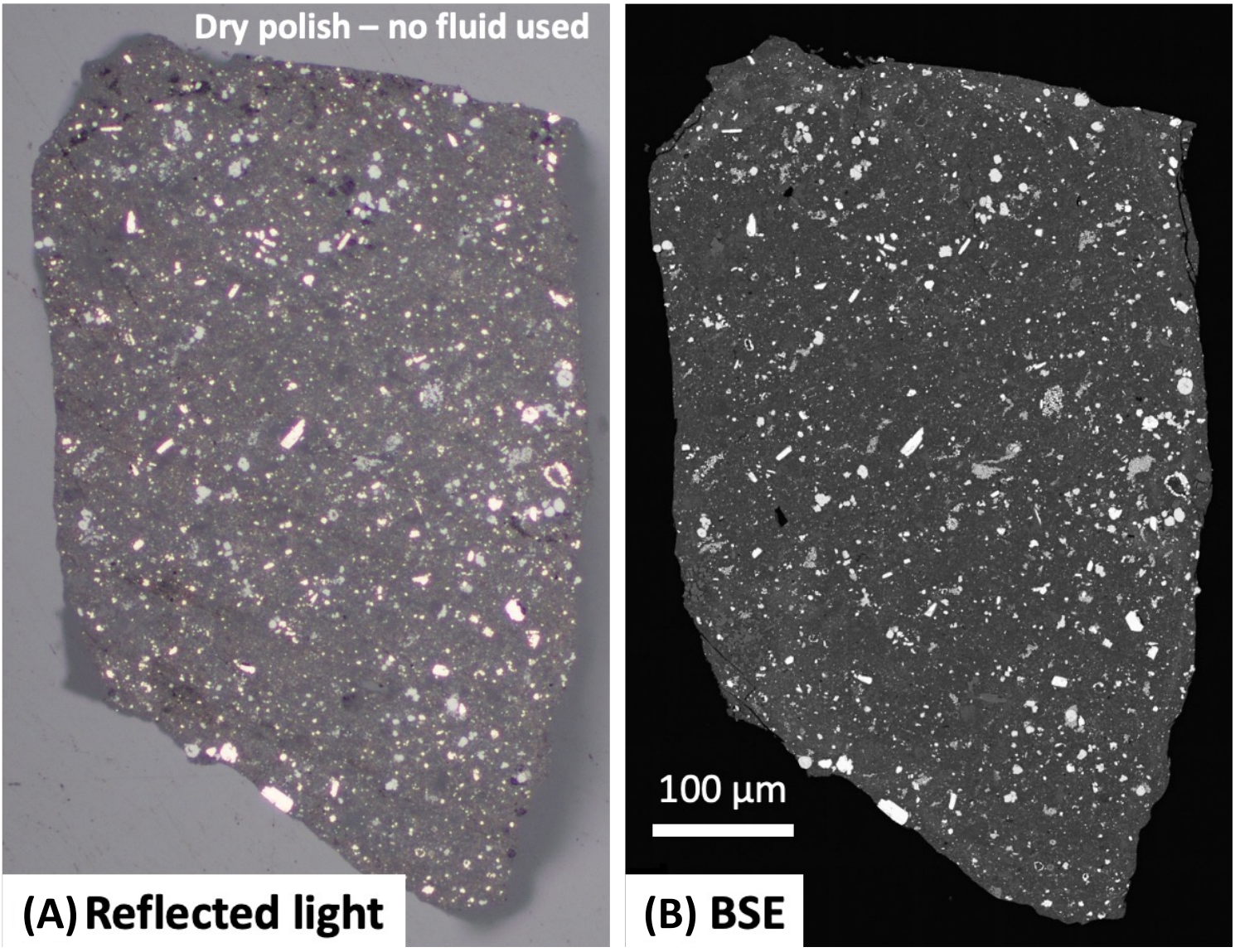
## Supplementary information

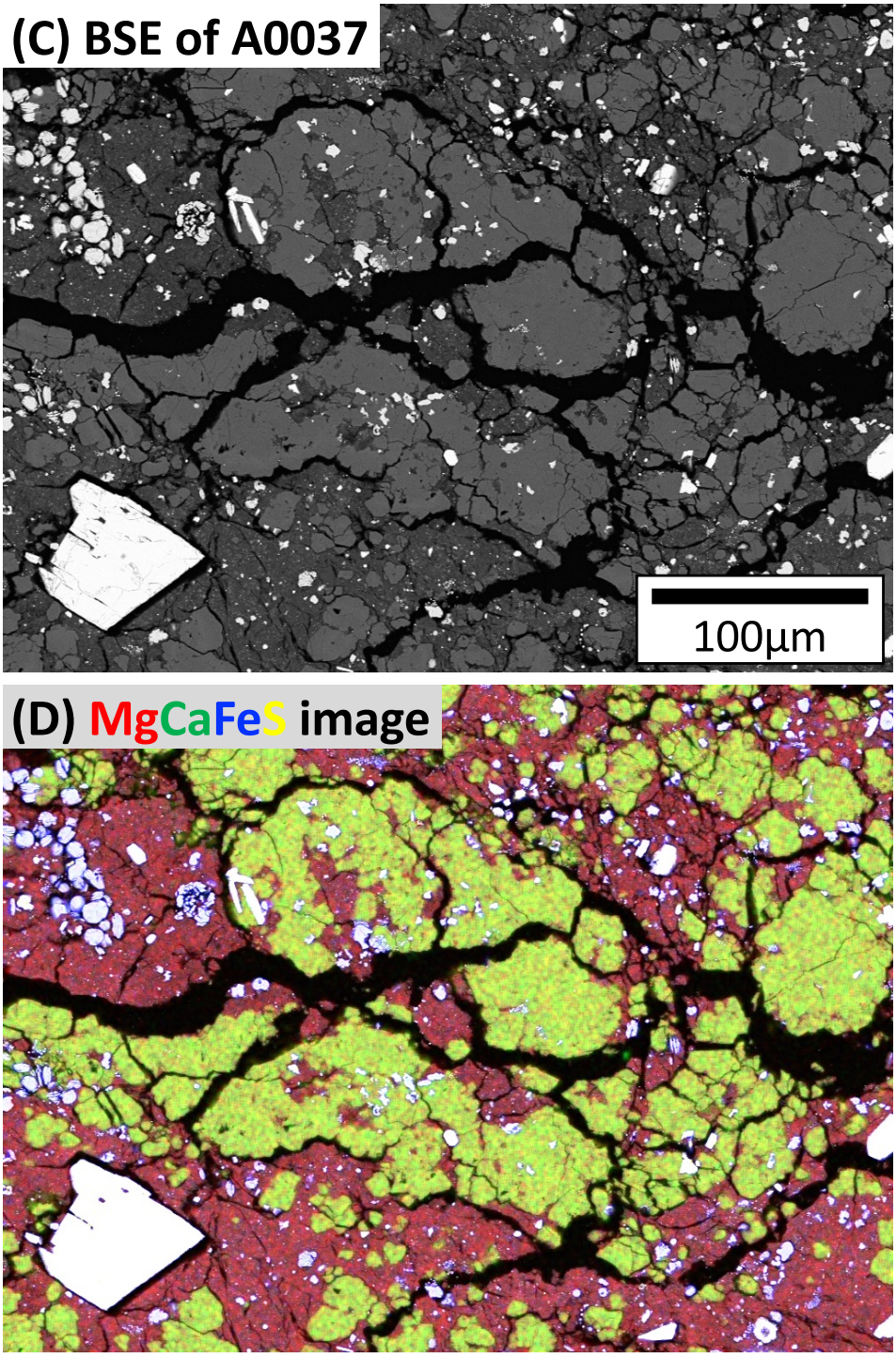
# A pristine record of outer Solar System materials from asteroid Ryugu's returned sample

In the format provided by the authors and unedited

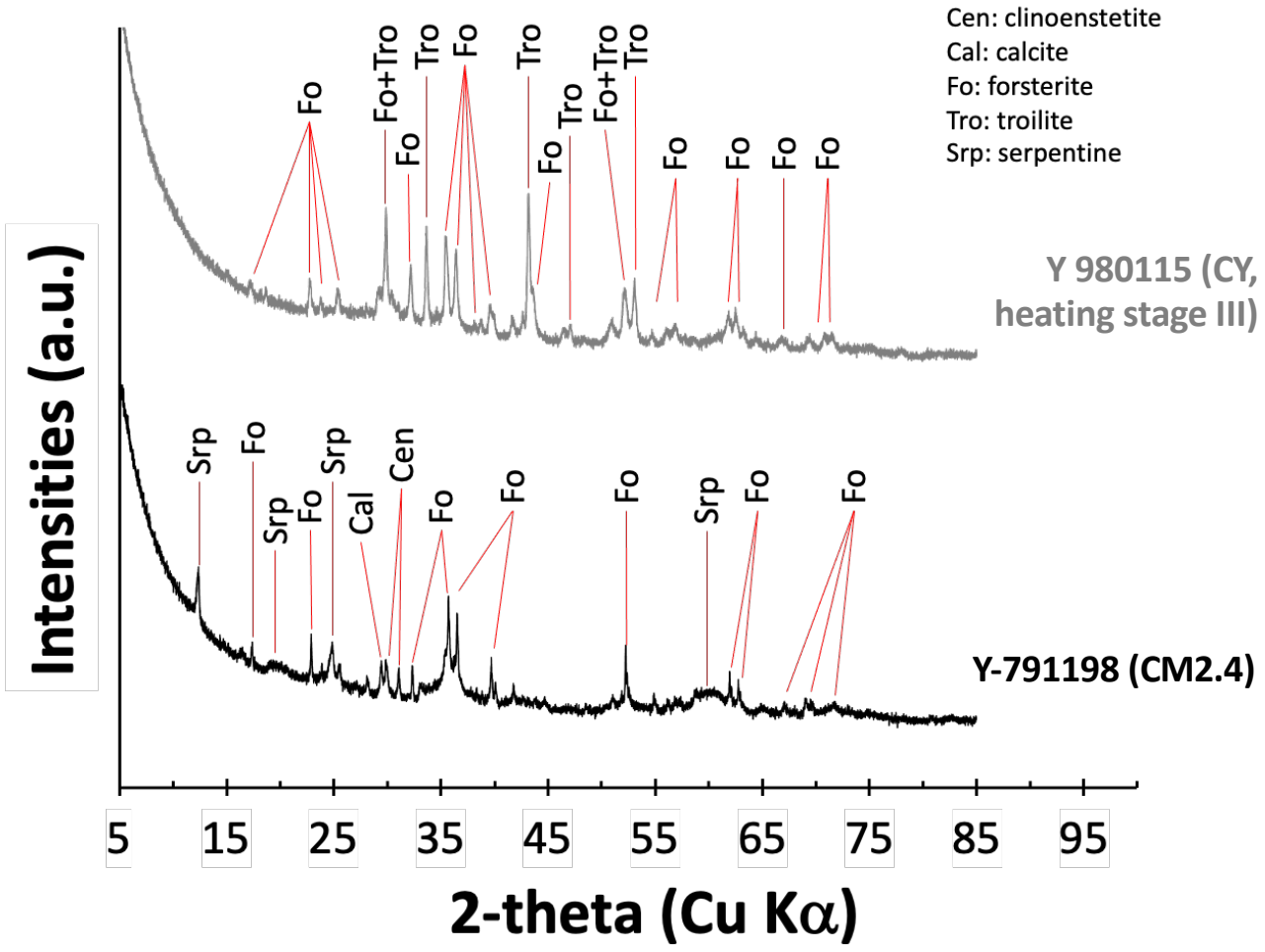
**Supplementary Fig. 1. (A) reflected light and (B) back scattered electron images of Ryugu C0068.**



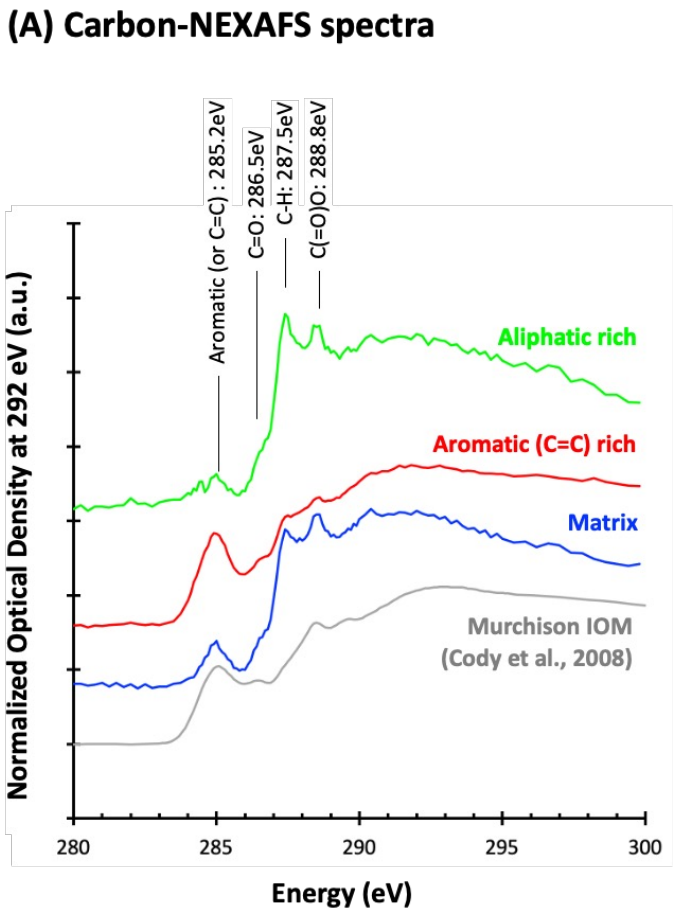
**Supplementary Fig. 1. (C) BSE image and (D) a combined X-ray map composed of Mg Ka (red), Ca Ka (green), Fe Ka (blue), and S Ka (yellow) of Ryugu A0037.**

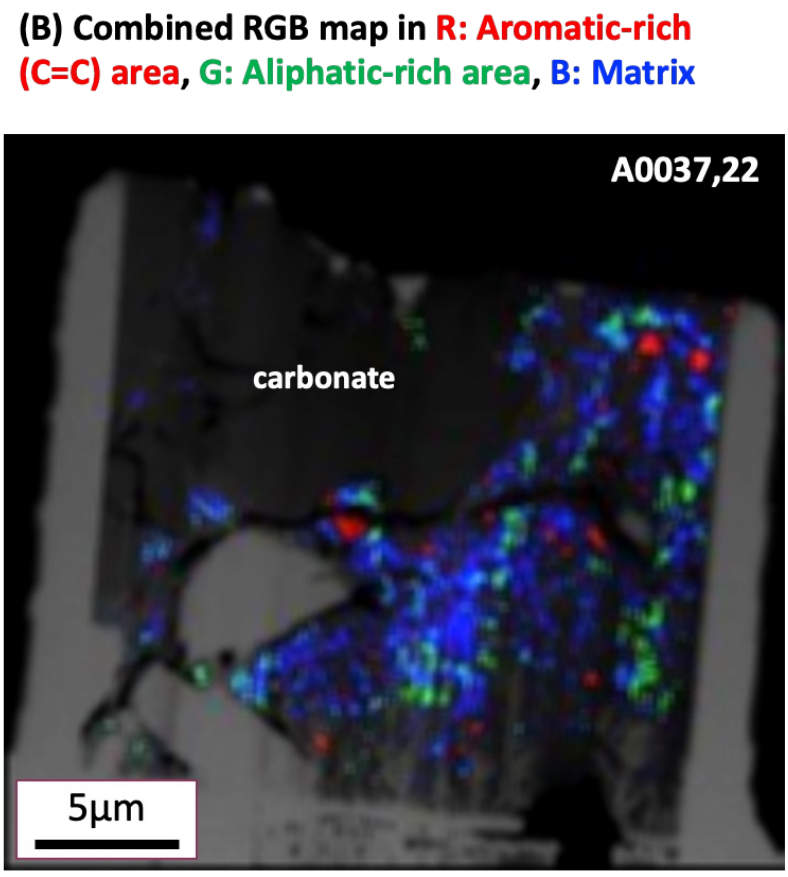


**Supplementary Fig. 2. Powder XRD patterns of Y 980115 (CY, heating stage III, 500-750˚C: grey line) and Y-791198 (CM2.4: black line).**



**Supplementary Fig. 3. Scanning transmission X-ray microscopy (STXM) imaging analysis of a FIB section of the Ryugu A0037,22.** (A) Carbon-NEXAFS spectra normalized at 292 eV of aromatic (C=C)-rich regions (red), aliphatic-rich regions (green), and matrix (blue). The grey line shows a spectrum of Murchison IOM[16] for comparison. (B) Combined RGB map in R: Aromatic-rich (C=C) area, G: Aliphatic-rich area, B: Matrix.



**Supplementary Fig. 4. A flow chart for Ryugu particle analysis.**