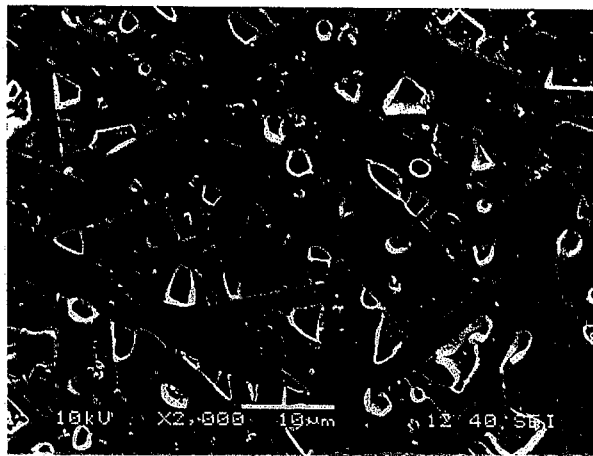


1. Draw a schematic diagram showing a mixed dislocation, including the dislocation line and Burger's vectors, as well as the applied shear force. (10%)
2. Explain how you can distinguish (1) a cold rolled pure copper sheet from a hot rolled pure copper sheet; (2) a pure silver rod with ASTM grain size number of 5 from a pure silver rod with ASTM grain size number of 10. (10%)
3. Both cleavage and twinning in iron are favored by increasing the strain rate. Rationalize this statement. (10%)
4. Discuss how the microstructure of the steel affects the impact strength of a polycrystalline mild steel shaft with a uniform diameter of 10 cm. (10%)
5. One micrograph of a barium niobate ( $Ba_5Ti_4O_{15}$ ) is shown below. The specimen was sintered at  $1300^{\circ}\text{C}$  for 3 h. Please estimate the relative density and grain size for the specimen. (10%)



6. Name possible point defects types in NaCl due to the addition of  $\text{CaCl}_2$ . State assumptions, if any. (10%)
7. Sketch the chemical structure for poly(butylene terephthalate) (PBT). (4%) Of poly(butylene terephthalate) and poly(ethylene terephthalate), which one would be more flexible? Why? (6%)
8. Of poly(hexamethylene adipamide) and poly(hexamethylene adipate), which polymer would be best suited for use as cloth? Why? (10%)
9. What are (1) pn junction, (2) Schottky junction, and (3) Ohmic contact? Please describe the properties and applications of pn junction, Schottky junction, and Ohmic contact in electronic devices. (12%)
10. Please describe the possible thermal issues in (1) nanoscale electronic devices (2) high power light emitting diodes (LEDs)? Please also describe the possible strategies to overcome the thermal issues in the devices. (8%)

試題隨卷繳回