Innovative technique of glass beads preparation in microwave oven

Nuclear Recycle Group

Glass beads of different size, shape, composition and having specific physical properties are needed for various applications in industry, research and development laboratories. Conventionally glass beads are prepared by melt quench technique, where the molten glass droplets are formed and quenched on rotating or vibrating surface to get smooth spherical glass beads. Alternatively, glass beads are commercially prepared from glass cullets. The cullets are coated with carbon prior to heating to avoid fusing, fed in inclined rotating tube furnace, heated near glass softening temperature, shaped in spherical form and quenched in water. Both these processes require elaborate heating arrangement and are laborious and time consuming. In addition, it is difficult to get the beads of specific composition and properties in small quantities from glass bead manufacturer.

An innovative technique for preparation of glass beads in domestic microwave oven was developed for preparation of spherical glass beads of uniform size for various applications in our laboratory. A graphite bed of three to five mm thick was prepared from fine graphite powder on alumina fiber insulating board. Glass pieces of required size and composition were spread on the bed uniformly taking care that they do not touch each other and placed in microwave oven. Microwave oven was put on for ~20 minutes at full power. Graphite being very good microwave absorber efficiently couples with the microwave radiation and gets heated up to 800°-900° C. The glass cullet when heated near its melting temperature, acquire spherical shape due to surface tension. The graphite bed was allowed to cool and the glass beads were sieved, cleaned and segregated. The temperature of the bed was controlled by heating time of microwave oven and adjusted depending upon the melting temperature of glass.

Scandium containing borosilicate glass beads were prepared by this technique and supplied to IAD, BARC for radioactive particle tracking experiment and flow visualization studies. By similar technique, charcoal coated glass beads were successfully prepared. These coated beads find application in treatment of High Level Waste containing Ru and Mo.

Stages of formation of glass beads in microwave oven

Irregular shape Partially soft Moltenstate Cooled to ambient

Charcoal Coated glass beads Scandium glass beads