In one aspect, there is provided a dispersion of cerium based particles described herein in a liquid medium.

The cerium based particles and dispersions of the invention can advantageously be used to prepare polishing compositions, especially adapted to CMP applications.

In another aspect, there is provide a use of the cerium based particles described herein or the dispersion described herein for the preparation of a polishing composition, more particularly a chemical mechanical polishing composition.

In yet another aspect, there is provided a polishing composition comprising the cerium based particles described herein or the dispersion described herein.

In a further aspect, there is provided a method of removing a portion of a substrate, the method comprising polishing the substrate with a polishing composition described herein.

In yet another aspect, there is provided a semiconductor comprising a substrate polished by the method described herein.

Advantageously, the rough surface of the particles of the invention increases their surface specific area by comparison with smooth-surfaced cerium oxide particles. Accordingly, by increasing the contact surface between the particles and the substrate to be polished, the abrasive properties of the rough-surfaced particles of the invention are improved, allowing to advantageously use them in a chemical mechanical polishing process. By comparison with smooth-surfaced cerium oxide particles of equivalent sizes, the rough-surfaced particles of the invention allow higher removal rate while maintaining a low defectuosity thanks to appropriate size distributions.

Contrary to cerium oxide particles having auxiliary particles formed on the surface of mother particles such as the ones disclosed in US 2015/0072522, the protrusions forming the rough surface of the particles of the invention are integrally formed therewith. Over a certain period of use in a polishing process, the surface of the particles of the invention may possibly erode but cannot be removed like auxiliary particles. Advantageously, the

particles of the invention have a longer lasting use and minimize the manufacturing wastes by the end users.

FIGURES

Figures 1 to 5 are SEM pictures of particles according to the invention respectively obtained by examples 1, 2, 3, 5 and 6.

Figure 6 to 8 are SEM pictures of particles of cerium oxide respectively obtained by comparative examples 1 to 3.

Figure 9 is a schematized shape of the face of the particle of figure 3.

Figure 10 is a view of the particles by TEM illustrating the blunt aspect of the protrusions thereof.

Figure 11 is a TEM picture of the particles prepared in example 1 after the application of ultrasound as detailed in example 7.

The SEM images were obtained with a SEM S-5500 of Hitachi High Technologies Corporation. The TEM images were obtained with a TEM JEOL JEM 1400 120kV with a Gatan camera : Orius 2k-2k.