Synthesis & characterization Al₂O₃ nanobelts through a simple route

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In recent years, there has been much recent progress in our understanding of various properties of aluminum oxide commonly known as alumina [1]. It is a versatile and technologically important material, because of its wide transparency window from ultra-violet to mid-infrared [1–3], good thermal and chemical stability [4], and mechanical properties. It is used for the preparation of high-reflective mirrors, antireflective coatings, optical filters, and other laser mirrors for laser systems and ultrahigh-density magnetic recording materials.

Figure 1: SEM images of Al₂O₃ nanobelts

For the synthesis of aluminum oxide (Al₂O₃) nanobelts at very low temperature, catalyst and surfactant free approach has been employed using hydrothermal method [5]. The novel approach is based on a simple reaction of aluminum powder and water at 110 °C. The width of nanobelts is relatively uniform, ranging from 50±10 nm with length of few micrometers. The reported method besides being catalyst free is economical, fast and free of pollution, which will make it suitable for large-scale production.

The synthesized samples were characterized by Powder X-ray diffraction technique and Scanning electron microscopy (SEM) to study the structural and the morphological features. SEM images at two different magnifications have been shown in Figure 1. The formation of Al₂O₃ nanostructures from the reagents of aluminum and water can be explained by the following facile reaction

Keywords: hydrothermal synthesis; aluminum powder; nanobelts

References

1. Avci N, Musschoot J, Smet PF, Korthout K, Avci A, Detavernier C, Poelman D (2009) J Electrochem Soc 156:J33337
2. Jiang D, Hulbert DM, Anselmi-Tamburini U, Ng T, Land D, Mukherjee AK (2008) J Am Ceram Soc 91:151–154
3. Palik ED (1998) Handbook of optical constants of solids, vol 3. Academic Press, San Diego
4. Boumaza A, Favaro L, LeDion J, Sattonnay G, Brubach JB,
5. Berthet P, Huntz AM, Roy P, Te'tot R (2009) J Solid State Chem 182:1171–1176 [5] Dar F.A., Sofi A.H. & Shah M.A. International Nano Letters .5(2), 67-70.