Department of Physics Engineering

* nonmember

Surface Migration is a Crucial Factor for Growth of a-c Oriented YBCO Thin Films, Tamio ENDO, Hideaki KOHMOTO, Shin-ichi IWASAKI, Masaomi MATSUO, Masahito MATSUI, Yasushi KUROSAKI, Hitoshi NAKANISHI* and Kazuhisa NIWANO*: Proceeding of JSPS-DST (India) Asia Academic Seminar 2001, (Hyderabad), pp. 205-223, 2003.

In order to clarify mechanisms of a-c orientation growth of $YBa_2Cu_3O_X$ thin films, the films were deposited on MgO by ion beam sputtering employing various deposition parameters. The "surface migration" model is proposed by the results. At lower substrate temperatures (T_S), the a-phase growth is dominated. With increasing T_S, the c-phase ratio increases due to larger thermal surface migration. The a-phase growth is enhanced by the plasma. The a-phase ratio increases while the c-phase ratio decreases with increasing oxygen partial pressure P_O. This can be interpreted by sputtered particles kinetic energy assisted surface migration. The plasma has larger collision cross section, then the particle energy is reduced, resulting in the enhancement of a-phase growth. The proposal of surface migration mechanism can be supported by three additional experiments. The growth of a-phase is enhanced by increases in (1) "film" surface roughness, (2) "substrate" surface roughness based on "polishing" and (3) "substrate" surface roughness due to "plasma exposure". This is because the surface migration is suppressed by larger surface barrier.

20 Years for the Study of Tribology and Lubricant's Properties under High Pressure (in Japanese), Science Technology and Future, Teijin Shougakukai, Yuichi NAKAMURA, pp. 342-344, 2003.

This introduced the importance of physical properties of lubricants under high pressure (e.g., density, elastic constant and viscosity) for the tribological evaluation (i.e. friction and wear) of rolling bearings, gears and traction drives. 20 years studies for the application of a diamond-anvil pressure cell (DAC) for tribological measurements were also introduced. As an example, the viscosity measurements of traction oil up to 2 GPa, 200℃ were illustrated with a falling sphere viscometry in the DAC.