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Technical Papers for ASM Transactions Quarterly

The ASM Transactions Committee is inviting technical papers for consideration at its September meeting. Papers for this meeting should be submitted before 19 August 1968.

Manuscripts in triplicate, plus one set of unmounted original photographs and original tracings should be sent to the attention of John Parina, Staff Liaison, Transactions Committee, American Society for Metals, Metals Park, Ohio 44073.

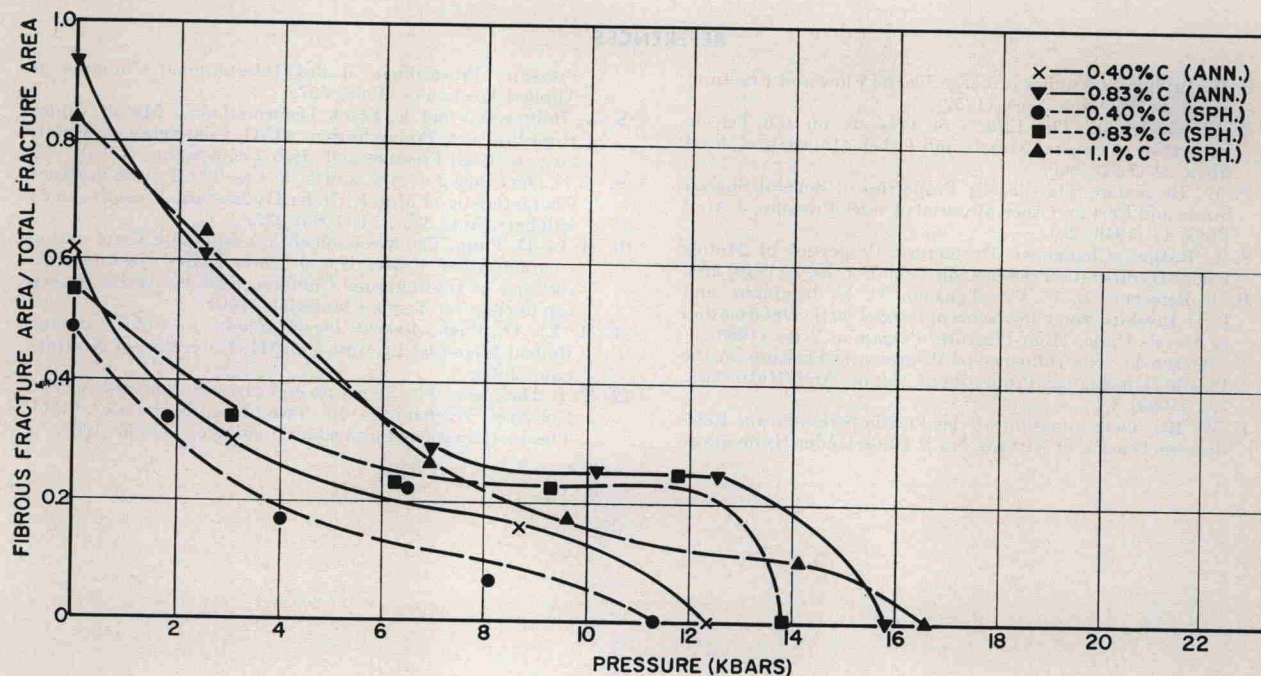


Fig. 9. Fibrous to total fracture area vs pressure for Fe - C materials.

fracture mode to progressively convert to one of planar shear (12). Such a shift in fracture mode may not change the macroscopic fracture appearance, but is observed by electron fractographic examination.

CONCLUSIONS

1. The effect of pressure upon the ductility of a series of annealed and spheroidized Fe - C materials ranging in carbon content from 0.004 to 1.1% C is highly structure sensitive in terms of the amount, shape and distribution of the cementite phase.

2. Annealed 0.004% C and spheroidized 0.40, 0.83 and 1.1% C materials exhibit a linear relationship between true strain to fracture and pressure with the slope decreasing with increasing carbon content.

3. Annealed 0.40, 0.83 and 1.1% C materials exhibit a polynomial relationship between pressure and true strain to fracture with the slope increasing with increasing pressure. The slope at low pressure and that for the best fit linear relationship for these material decreases with increasing carbon content. The slope at high pressure approaches that for the spheroidized materials.

4. The elongation as a function of pressure increases rapidly at lower pressures, then levels, or tends to level off, at higher pressures in all but the brittle annealed 1.1% C material. The leveling off of the increase in elongation is attributed to the pressure only affecting the area reduction in the necked region and not the uniform strain. . . In the 1.1% C

material, the elongation progressively increases with no leveling off even at 23.8 kbars. This is a combined effect of an effective increase in uniform strain, since brittle fracture is retarded, plus the contribution of the area reduction in necking.

5. No single or linear relationship exists for the materials investigated between pressure coefficient of ductility and strain hardening coefficient. A linear relationship does exist for the annealed 0.004% C and the spheroidized 0.40, 0.83 and 1.1% C materials, the remaining annealed materials falling far off this linear relationship.

6. No linear or continuous relationship exists between the ratio of fibrous to total fracture area as a function of pressure in those materials exhibiting a cup-cone type fracture at atmospheric pressure. There is a general decrease in the area ratio going to zero for all of the materials at high pressure. The pressure at which the fracture converts entirely to planar shear generally increases with increasing strength.

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