

Preface

Porous metallic materials such as foamed metals, sponge-like metals, structural cellular metals, metals with directional pores, and sintered metals are increasingly looked upon as potential light-weight structural and functional materials with, for example, superior sound absorption, damping, and filtering properties. The porous metals are a new category of promising engineering materials from the point of view of both fundamental science and industrial applications. To realize such applications, various problems in fabrication such as uniformity in pore size and porosity controlled with variable factors must be solved; furthermore, their properties must be sufficiently understood and elucidated. Toward that end, investigations into the science and technology of porous and foamed metallic materials definitely have been expanded recently.

It is well understood that porous and foamed metals should be useful in solving some major issues of the twenty-first century such as environmental preservation, aging societies, and energy problems. For example, foamed aluminum is expected to be used for crash absorbers in automobiles and for sound absorption, while porous metals with elongated directional pores may be useful for medical devices, machine tools, heat sinks, and in other ways. There are various fabrication methods, classified by power sintering, foaming, and casting techniques. Porous metals are further grouped into porous and cellular metals depending upon the magnitude of their porosity.

Among these porous and foamed metals, the porous metals with directional pores, the so-called lotus and gasar metals, have been attracting attention owing to their long cylindrical pores aligned in one direction. These are considered new types of porous metals. Recently, methods for their fabrication have almost been established at the mass production level. Various unique physical, chemical, and mechanical properties have been discovered and already have been fairly well understood. In addition, several applications are proceeding at the industrial manufacturing level. Thus, I consider that the present is a good time to organize and present the science and relevant technology of porous metals with directional pores. I hope that readers of this book can understand the present status of research and development of porous metals with directional pores for the benefit of progress in their research.

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